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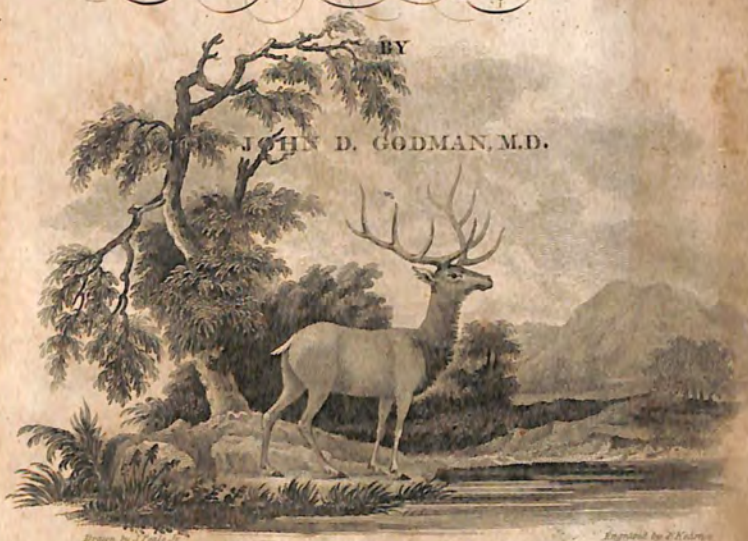
AMERICAN

Natural History

BY

JOHN D. GODMAN, M.D.



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AMERICAN

NATURAL HISTORY.

VOLUME II.

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PART I.—MASTOLOGY.

BY JOHN D. GODMAN, M.D.

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Eastern District of Pennsylvania, to wit:

L S BE IT REMEMBERED, That on the third day of July, in the fiftieth year of the Independence of the United States of America, A. D. 1826, Robert Wright, of the said district, hath deposited in this office the title of a book, the right whereof he claims as proprietor, in the words following, to wit:

"American Natural History. Volume II. Part I. Mastôlogy. By John D. Godman, M. D. professor of Natural History in the Franklin Institute of Pennsylvania; one of the Professors of the Philadelphia Museum; Member of the American Philosophical Society, of the Philadelphia Academy of Natural Sciences, &c.

In conformity to the Act of the Congress of the United States, intituled, "An Act for the encouragement of learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned"—And also to the Act entitled, An Act supplementary to an Act, entitled, An Act for the encouragement of learning, by securing the copies of Maps, Charts, and Books to the authors and proprietors of such copies, during the times therein mentioned, and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

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AMERICAN

NATURAL HISTORY.

CHAPTER I.

Family V.—Marsupialia; *Pouched or Marsupial Animals.*

The beings at present considered as members of this family, offer so many peculiarities and striking differences in their construction and economy, as in strictness to constitute a distinct order of animals; or if not, the remarkable differences which exist between the species in relation to their teeth, organs of digestion, food and habits, fully justify the arrangement of them under different orders in our existing classification.

They are wonderfully unlike all other animals in relation to the production of their offspring, which are brought forth in a condition apparently imperfect or premature. The young, when they are first to be discovered in the external pouch, seem scarcely formed, are incapable of movement, exhibit but slight traces of limbs or other external organs, are found attached to the teats of the mother, and are unable to resume their hold if it be broken. They remain thus attached until they acquire size and strength enough to move about

at will, and continue to take refuge in this curious retreat until they attain the size of a common rat, or are even larger. The pouch is formed by a process or elongation of the skin of the belly, and is supported by two peculiar bones which arise from the pubis, and are sustained by the abdominal muscles. What is more singular, the males of these animals also have such bones, although they have no pouch, and similar bones are observed in both sexes of species which have little or nothing of the pouch itself.*

Genus XIX. Opossum; *Didelphis;* L.

Germ. Beutelthier. *Fr.* Sarigue.

GENERIC CHARACTERS.

The head is conical, with a pointed muzzle and lateral nostrils; rounded, nearly naked and delicate

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* "La matrice des animaux de cette famille n'est point ouverte par un seul orifice dans le fond du vagin; mais elle communique avec ce canal par deux tubes latéraux en forme d'anse. Il parait que la naissance *prematurée** des petits tient à cette organisation singuliere. Les mâles ont le scrotum pendant en avant de la verge au contraire des autres quadrupédes."—Cuvier; Régne An. i. 170.

* We cannot avoid objecting in this place to the inaccuracy of expression occasionally indulged in by the most celebrated men, since the influence of their example under such circumstances, is as injurious as in opposite conditions it is beneficial. The *birth* of the young *is not premature* in these animals, but takes place in a perfectly regular and *mature* manner, according to their peculiar organization and nature, though it may be *apparently* premature when compared with other animals. M. Desmarest gives as the most striking character-

Engraved by W.E.Tucker
Opossum Male & Female
with their Young.

ears. The thickness of the body is great when compared with the length of the limbs. The digits on the anterior extremities are five in number, armed with hooked claws, and all lying parallel to each other. On the posterior extremities the internal digits are not in the same range with the rest, but are opposable, or constitute proper thumbs. They are rounded at the extremity, without nails, broad and fleshy. The soles of the posterior feet are provided with large fleshy tubercles, which materially aid in grasping small objects. The females of this genus have a fold of the skin of the belly, so arranged as to form a marsupium or pouch capable of receiving the young after birth; the teats, eight in number on each side, are within this pouch, which is supported by two bones of considerable length, articulated with the pubis and connected with the muscles of the belly. The males also have similar bones, but no pouch.

Dental System.

50 Teeth:

- 26 Upper
  - 10 Incisive
  - 2 Canine
  - 14 Molar.
    - 6 False Molar
    - 8 Molar
- 24 Lower
  - 8 Incisive
  - 2 Canine
  - 14 Molar.
    - 6 False Molar
    - 8 Molar.

In the upper jaw the incisors are situated at the extremity of a very elongated ellipsis. The

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istic of this family, "*birth of the young premature,*" ("*naissance* des petits prematurée") which is entirely at variance with fact and philosophy. An American translator of Desmarest has advanced still farther, and "capped the climax" of absurdity by rendering the words above quoted, "growth of the young *premature!*"

first is cylindrical, hooked and longer than the four following, which resemble each other and are trenchant. To these succeed a very marked depression, and then the canine which is compressed, terminates in a point and is hooked, but with rounded edges. At its base there is a very small but normal false molar, to which succeeds a vacant space, and then two equally regular false molars, the last of which is a little larger than the preceding. The three first molars successively and gradually increase in size, and have the same forms. At first the inner base is elevated nearly as high as the prisms; these are merely distinguished by the points, which are only developed at the three angles presented by a section of them, the anterior being much smaller than the posterior; its anterior point is very small. Finally, the inner base is carried obliquely forward, in consequence of which there is left between each tooth on the inside of the jaw an angular vacuity, much larger than in the insectivorous animals, where this base is uniformly developed. The last molar only differs from the others in being truncated at its posterior part, like all the last upper molars in animals of this order.

In the lower jaw we find four incisors, obliquely inclined forwards, of a cylindrical form, and nearly equal in size. The canine, which are in no respect peculiar, follow; then come three false molars, one very small, at the base of the canine, and after a vacant space the two others, somewhat larger than the first, but the middle is the largest, and all three are normal. The four molars are composed, anteriorly, of three points, disposed in a triangle, and

posteriorly, of a spur also composed of three tubercles, but less regularly disposed and less elevated than those of the anterior part: the external is the largest.

There is nothing very peculiar to be observed respecting the relative position of these teeth.

Species I.—*The Common Opossum.*

Didelphis Virginiana; Penn. Gmel. &c.

Le Manicou: Feuille, Obs. Peru, iii. 206.
Tlaquatzin: Hernand. Mexico, 330.
Opossum: Lawson's Carolina, 120. Catesby's Carolina, App. xxix.
Sarigue des Illinois: Buff. Sup. tom. vi. pl. 33. Sarigue à long poil, Ibid pl. 34.
Didelphis Opossum: L. Gmel. Syst. Nat. i. p. 105.
Micouré premier: D'Azzara, Quad du Paragua, Trad. Fran. i. p. 244.
Virginian Opossum: Penn. Quad. ii. p. 18, No. 217, Shaw, i. part 2, pl. 107.
Didelphis Woapink: Barton, Facts and Conjectures, &c.

Centuries have elapsed since this species was first observed by European naturalists, and it has long been a frequent theme of admiration and discussion to those of America, yet it is still considered as a sort of anomaly among animals, and the peculiarities of its sexual intercourse, gestation, and parturition, are to this day involved in profound obscurity. Perhaps nothing can more clearly demonstrate the impatience of the human mind, and the reluctance with which men yield to the hard necessity of carefully observing the operations of nature, than the history of this animal. Volumes of facts and conjectures have been written on the subject, in which the proportion of *conjecture* to *fact* has been as a

thousand to one, and the difficulties still remain to be surmounted. The animal is among the most common within our borders, and is annually killed or captured in large numbers; faithful investigations into the habits of a few individuals would be sufficient to settle all doubts forever, and yet these still remain to be made. Very full and interesting observations have been made at almost every other period; but the great question how the helpless offspring, weighing scarcely a grain, are conveyed into the external pouch and attached to the teat of the mother, has never been properly answered.

For obvious reasons we shall wave for the present the consideration of these particulars. In our appendix we hope to give a full description of the sexual peculiarities of this very singular animal, and may then have it in our power to remove all the obscurities from the subject, by the only true method, that of a patient and vigilant observation of nature.

The opossum is very remarkable from other peculiarities, besides those which relate to the continuation of its kind. In the first place, we have already seen that it has a very large number of teeth, and its hind feet are actually rendered hands by short, fleshy and opposable thumbs, which, together with the prominences in the palms of these posterior hands, enable the animal to take firm hold of objects which no one would think could be thus grasped. An opossum can cling by these *feet*-hands to a smooth silk handkerchief or a silk dress, with great security, and climb up by the same. In like manner he can ascend by a skein of silk, or even a few threads. The slightest projection or doubling

of any material, affords him a certain mean of climbing to any desired height. Another curious and amusing peculiarity is his prehensile tail; by simply curving this at the extremity, the opossum sustains his weight and depends from a limb of a tree, or other projecting body, and hanging in full security, gathers fruit or seizes any prey within his reach; to regain his position on the limb it is only necessary to make a little stronger effort with the tail and throw his body upward at the same time.

In speaking of the more obvious peculiarities of the opossum, we may advert to the thinness and membranous character of the external ears, which may remind us in some degree of what has been heretofore said relative to the perfection of the sense of touch possessed by the bat, in consequence of the delicacy of the extended integument forming the ears and wings. The extremity of the nose of our animal is also covered by a soft, moist and delicate integument, which is no doubt very sensitive. On the sides of the nose, or rather on the upper lip, there are numerous long and strong divergent whiskers or bristles, projecting to the distance of nearly three inches; over each eye there are two long black bristles, rather softer than the others, somewhat crisped or undulated, and slightly decurved; while, on the posterior part of the cheek, and about an inch below and in front of the ear, there is a bunch of long, straight bristles, (very similar to those of a hog) six or eight in number, projecting laterally so as to form a right angle with the head. When the elongated conical form of the opossum's head is recollected, together with its nocturnal habits, we cannot avoid remarking

that all these arrangements appear to have immediate reference to the safety of the animal, furnishing the means of directing its course, and warning it of the presence of bodies which otherwise might not be discovered until too late.

The mouth of the opossum is very wide when open, yet the animal does not drink by lapping, but by suction. The wideness of the mouth is rendered very remarkable when the female is approached while in company with her young. She then silently drops the lower jaw to the greatest distance it is capable of moving, retracts the angles of the lips, and shows the whole of her teeth, which thus present a formidable array. She then utters a muttering kind of snarl, but does not snap until the hand or other object be brought very close. If this be a stick or any hard or insensible body, she seldom closes her mouth on it after the first or second time, but maintains the same gaping and snarling appearance, even when it is thrust into her mouth. At the same time the young, if they have attained any size, either exhibit their signs of defiance, take refuge in the pouch of the mother, or, clinging to various parts of her body, hide their faces amidst her long hair.

The general colour of the opossum is a whitish gray. From the top of the head along the back and upper part of the sides the gray is darkest, and this colour is produced by the intermixture of coarse white hairs, upwards of three inches long, with a shorter, closer, and softer hair, which is white at base and black for about half an inch at tip. The whole pelage is of a woolly softness, and the long white hairs diverging considerably, allow the black parts to be seen,

so as to give the general gray colour already mentioned. On the face the wool is short and of a smoky white colour; that on the belly is of the same character, but longer on the fore and hind legs; the colour is nearly black from the body to the digits, which are naked beneath. The tail is thick and black for upwards of three inches at base, and is covered by small hexagonal scales, having short rigid hairs interspersed throughout its length, which are but slightly perceptible at a little distance. The opossum is generally killed for the sake of its flesh and fat. Its wool is of considerable length and fineness during the winter season, and we should suppose that in manufactures it would be equal to the sheep's wool which is wrought into coarse hats.

The opossum is a nocturnal and timid animal, depending more on cunning than strength for his safety. His motions are slow, and his walk when on the ground entirely plantigrade, which gives an appearance of clumsiness to his movements. When on the branches of trees he moves with much greater ease, and with perfect security from sudden gusts of wind; even were his weight sufficient to break the limb on which he rests, there is no danger of his falling to the earth, unless when on the lowest branch, as he can certainly catch and securely cling to the smallest intervening twigs, either with the hands or the extremity of the tail. This organ is aways employed by the animal while on the smaller branches of trees, as if to guard against such an occurrence, and it is very useful in aiding the opossum to collect his food, by enabling him to suspend himself from a branch

above, while rifling a bird's nest of its eggs, or gathering fruits.

The food of the opossum varies very much according to circumstances. It preys upon birds, various small quadrupeds, eggs, and no doubt occasionally upon insects. The poultry-yards are sometimes visited, and much havoc committed by the opossum, as, like the weazel, this animal is fonder of cutting the throats and sucking the blood of a number of individuals, than of satisfying his hunger by eating the flesh of one. Among the wild fruits the persimmon (*Diospyros Virginiana*) is a great favourite, and it is generally after this fruit is in perfection that the opossum is killed by the country people for the market. At that season it is very fat, and but little difference is to be perceived between this fat and that of a young pig. The flavour of the flesh is compared to that of the roasting pig; we have in several instances seen it refused by dogs and cats, although the opossum was in fine order and but recently killed. This may have been owing to some accidental circumstance, but it was uniformly rejected by these animals, usually not very nice when raw flesh is offered.

The hunting of the opossum is a favourite sport with the country people, who frequently go out with their dogs at night, after the autumnal frosts have begun and the persimmon fruit is in its most delicious state. The opossum, as soon as he discovers the approach of his enemies, lies perfectly close to the branch, or places himself snugly in the angle where two limbs separate from each other. The dogs, how-

ever, soon announce the fact of his presence by their baying, and the hunter ascending the tree discovers the branch upon which the animal is seated, and begins to shake it with great violence to alarm and cause him to relax his hold. This is soon effected, and the opossum attempting to escape to another limb is pursued immediately, and the shaking is renewed with greater violence, until at length the terrified quadruped allows himself to drop to the ground, where hunters or dogs are prepared to despatch him.

Should the hunter, as frequently happens, be unaccompanied by dogs when the opossum falls to the ground, it does not immediately make its escape, but steals slowly and quietly to a little distance, and then gathering itself into as small a compass as possible, remains as still as if dead. Should there be any quantity of grass or underwood near the tree, this apparently simple artifice is frequently sufficient to secure the animal's escape, as it is difficult by moonlight or in the shadow of the tree to distinguish it, and if the hunter has not carefully observed the spot where it fell, his labour is often in vain. This circumstance, however, is generally attended to, and the opossum derives but little benefit from his instinctive artifice.

After remaining in this apparently lifeless condition for a considerable time, or so long as any noise indicative of danger can be heard, the opossum slowly unfolds himself, and creeping as closely as possible upon the ground would fain sneak off unperceived. Upon a shout or outcry in any tone from his persecutor, he immediately renews his death-like

attitude and stillness. If then approached, moved or handled, he is still seemingly dead, and might deceive any one not accustomed to his actions. This feigning is repeated as frequently as opportunity is allowed him of attempting to escape, and is known so well to the country folks as to have long since passed into a proverb. "He is playing *'possum*" is applied with great readiness by them to any one who is thought to act deceitfully, or wishes to appear what he is not.

The usual haunts of the opossum are thick forests, and their dens are generally in the hollows of decayed trees, where they pass the day asleep, and sally forth mostly after night-fall to seek for food. They are occasionally seen out during day-light, especially when they have young ones of considerable size, too large to be carried in the maternal pouch. The female then offers a very singular appearance, as she toils along with twelve or sixteen cubs nearly of the size of rats, each with a turn of his tail around the root of the mother's, and clinging on her back and sides with paws, hands and mouth. This circumstance was thought distinctive of another species, hence called *dorsigera*, but is equally true of the common or Virginian opossum. It is exceedingly curious and interesting to see the young, when the mother is at rest, take refuge in the pouch, whence one or two of them may occasionally be seen peeping out, with an air of great comfort and satisfaction. The mother in this condition, or at any time in defence of her young, will make battle, biting with much keenness and severity, for which her long canine teeth are well suited.

If taken young the opossum is readily tamed and becomes very fond of human society, in a great degree relinquishes its nocturnal habits, and grows troublesome from its familiarity. We have had one thus tamed which would follow the inmates of the house with great assiduity, and complain by a whining noise when left alone. As it grew older it became mischievous from its restless curiosity, and there seemed to be no possibility of devising any contrivance effectually to secure it. The same circumstance is frequently remarked by persons who have attempted to detain them in captivity, and of all the instances which have come to our knowledge, where even a great number were apparently well secured, they have all in a short time enlarged themselves and been no more heard of. In some such instances these animals have escaped in the city, and for a long time have taken up their quarters in cellars, where their presence has never been suspected, as during the day they remain concealed. In this way it is very probable that many are still living in the city of Philadelphia, obtaining a plentiful food by their nightly labours.

In Dr. Barton's facts and conjectures on the opossum, he mentions as a circumstance worthy of curiosity, the faculty the opossum has of lying on its back. We have observed this action of the animal, but could see nothing in it very different from what is very frequently done by the dog, cat, marmot, squirrel, and various other animals, which occasionally place themselves sufficiently on the back to expose the inferior surface of the body fully; but that this action in the opossum is indicative of any peculiarity,

or is the ordinary position chosen by the animal, is what we cannot state from our own observation.

The size of the full grown opossum is about twenty inches, and that of the tail twelve; the weight is about fourteen pounds. The number of young is from twelve to sixteen. There is therefore not much probability of the species becoming very scarce, especially as their nocturnal mode of life renders it by no means necessary that they should fly to very remote distances from the habitations of man.*

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* It is amusing to read the accounts of the wonderful medical virtues which have been attributed to the tail of this animal, in some of the older writers on the natural history of our continent. The following is a good specimen of the credulity and disposition to deal in the marvellous, which was formerly thought to form an almost essential quality in the natural historian:—"The tail of this animal (says MARCGRAVE) is a singular and wonderful remedy against inflammation of the kidneys; for if it be broken, and the quantity of a drachm of the water in which it is steeped be drunk sometimes, fasting, it wonderfully cleanses the ureters, expels calculi and other obstructions, [excitat venerem, et generat lac, medetur colicis doloribus, prodest parientibus et accelerat partum, promovet menses,] and if it be chewed and placed on a part into which thorns have been thrust, it extracts them, loosens the bowels, and I believe in all New Spain there is not to be found another remedy as useful in so many cases."—*Hist. Ker. Nat. Brasil, lib. vi. p.* 22.

The above passage may have served as a hint to the celebrated CUMBERLAND, who, in one of his amusing works, introduces a quack, soliloquising on the virtues of a dried lizard's tail in the following words:

"Thou wilt pulverize most featly," quoth he, "when I

CHAPTER II.

Order IV. Glires; L. *Gnawers.*

SECTION I.—CLAVICULATA.

Having perfect, and in some, very strong clavicles.

The animals belonging to this order have the brain nearly smooth and without convolutions; the orbits of the eyes are not separated from the temporal cavities, which are slight; the eyes are directed laterally; the zygomatic arches are delicate and curved downwards, indicating feebleness in the jaws; the fore arm can scarcely be turned, and the two bones

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have thee under the pestle; but before I consign thee to the mortar and reduce thee to dust, let me ponder upon thy properties, and do nothing without forecast and circumspection. Poisonous thou can'st not be, for though I have never eaten of thy species myself, I know that others have; and if thy flesh be delicate, thy dust cannot fail to be wholesome; nay, I doubt not but it is medicinal. Thou hast other virtues, if I could but recollect them; there is something more about thee; something I have read in learned authors of the back-bone of a lizard; and thine, heaven be prais'd, I perceive is perfect and entire; but whether it is recorded as a provocative to incontinency, or as a preventative, I cannot to a certainty recollect: upon second thoughts, I suspect thou art a stimulative; as I'm a sinner, I suspect thou art of a stirring quality, for thy tail betokeneth it."

are often consolidated. Those possessing the strongest clavicles exhibit some intelligence, and use their fore feet to convey their food to the mouth. They have the posterior extremities generally higher than the anterior, by which they are rendered fitter for leaping than running. Their intestines are very long, and the stomach is simple, or but little divided; the cœcum is often larger than the stomach itself.

These animals are provided with two large cutting teeth in both jaws, separated by a vacant space from the molars, and such teeth are exclusively destined to disintegrate solid bodies by repeated efforts, by nibbling or *gnawing;* the name of the order has been derived from this circumstance in various languages. The cutting teeth are enamelled only on the anterior surface, so that as the posterior surfaces wear away first, they always preserve a beveled edge. They grow from the root as rapidly as they wear at the edge, and when an opposing tooth is broken or lost, the other grows so rapidly as to become monstrous. The lower jaw is articulated by a longitudinal condyle, and has no other horizontal movement than from behind forwards and the reverse. The molar teeth have flat crowns, with transverse projections of enamel, in opposition to the horizontal motion of the jaw.

Those which have simple lines on the crowns instead of projections, and the whole surface of the molars very plane, are more exclusively frugivorous. Those whose teeth have these projections divided into blunt tubercles, are omnivorous; the small number which have points to these teeth, attack other ani-

mals more readily, and slightly approach carnivorous animals.*

Genus XX. Beaver; *Castor;* L.

Gr. Καστωρ	*Ital.* Bevero.
Fr. Biévre.	*Pol.* Bobr.
Ger. Biber.	*Swed.* Bœffwer.

GENERIC CHARACTERS.

The head is large, with a short and blunt snout, small ears and eyes, and the upper lip divided. The trunk of the body is thick, having four teats, two near the fore limbs, and two at the posterior part of the chest. The limbs are short, the anterior being somewhat larger than the posterior; all the feet have five short, free and flexible toes, which are webbed, and the posterior toes have the membrane longer and broader. The middle toe is always longest in the fore and hind feet; the thumb and little finger, on the external and internal digits, are the shortest, and equal to each other; the intermediate toes are of middling size and equal in length. All the digits are furnished with strong and slightly incurvated nails, which are fit for burrowing; those on the hind feet are rather the largest. The tail is peculiarly flattened, of an oblong, oval shape, broad and covered at base with thick fur; the remainder has a covering of scales.

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* See Cuvier, Régne Animal, p. 186.

Dental System.

20 Teeth:
- 10 Upper
  - 2 Incisive
  - 8 Molar.
- 10 Lower
  - 2 Incisive
  - 8 Molar.

IN THE UPPER JAW the incisors are flat, smooth and of a very great breadth, arising from the inferior and anterior part of the maxillary bone. The molars differ slightly from each other in size, and appear all to be composed of one internal and three external grooves, which being interrupted by the wearing of the teeth, at length merely present elliptical figures. Many of these external grooves are characterized by enlarging at their extremity. The germs of these teeth show the same number of grooves as we have described from partly worn teeth.

IN THE LOWER JAW the incisors are similar to those of the upper, and not less remarkable for great size; they rise far beyond and beneath the molars, between the coronoid process and condyle. The molars present absolutely the same characters, that is, the same figures as those in the opposite jaw; excepting that the three grooves are on the inner side of the tooth, and the external has but one. The germs of these teeth have also the strongest resemblance to the figures which are seen when the teeth are partly worn away.

1 *Beaver.* 2 *Muskrat.*

Species I.—*The Beaver.*

Castor Fiber; L. Erxl. &c.

Le Castor ou le biévre: Briss. Regn. An. p. 133.
Le Castor: Buff. viii. pl. 36.
Castor Fiber: Sabine, App. p. 659. Say, Long's Exped. to the Rocky Mountains, i. p. 464.

Truth, alike the object and reward of all rational inquiry, is too delicate and unobtrusive to be advantageously approached or estimated, unless the mental vision be entirely free from prejudice, and her votaries, for the sake of her unostentatious though unfading charms, forego the pride of worshipping the fantastic creatures of their own imaginations. Accessible to all who in the proper disposition seek her presence, how many ages have elapsed during which fiction has been pursued in her stead, till at length opinion gains such strength, and prejudice so deep a root, that the semblance passes into general acceptation for the substance, and what was at first the mere breath of speculation, becomes finally received and accredited as indubitable. Thankless is the office of the individual who ventures to overturn any of these *idols* of the mind;* to displace the illusions of fancy by cold reality, and disperse into thin air the fairy world which credulity first called into existence, and indolent imagination perpetuates. It must be confessed that occasionally

* "Excrevit autem mirium in modum, istud malum ex opinione quadam sive æstimatione inveterata verum tumida et damnosa; minui nempe mentis humanæ majestatem, si ex-

this is no pleasant task; yet it is one of the duties especially incumbent on the teacher of natural history, inasmuch as the exercise of imagination is always prejudicial to the study of nature, the sober reality of which, when correctly examined, possesses an interest far transcending that of all the fugitive beauties bestowed by this deluding faculty of the mind.

Who has not heard of the wonderful sagacity of the *beaver*, or listened to the laboured accounts of its social and rational nature? Who that has read the impassioned eloquence of BUFFON, to which nothing is wanting but truth in order to render it sublime, can forget the impression which his views of the economy and character of this species produced? The enchanter waves his wand and converts animals, congregated by instinct alone, and guided by no moral influence, into social, rational, intelligent beings, superior to creatures high above them in organization, and even far more exalted than vast tribes of that race which has been justly and emphatically termed "lords of creation." Alas, for all these air-drawn prospects! while we endeavour to gaze upon their beauties they fleet away and leave no trace behind.

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perimentis et rebus particularibus sensui subjectis et in materia determinatis diu ac multum versetur; præsertim quum hujusmodi res ad inquirendum laboriosæ, ad meditandum ignobiles, ad dicendum asperæ, ad practicam illiberales; numero infinitæ et subtilitate tenues esse soleant. Itaque jam tandem huc res rediit ut via vera non tantum deserta sed etiam interclusa et obstructa sit; fastidita experientia, nedum relicta, aut male administrata.—BACON; *Nov. Organ.*

The injury the mind receives from this source is scarcely to be appreciated, and among others, the false notions we form concerning the relative perfection and excellence of the plan of nature, may be considered as of the first magnitude. The beaver, for instance, is endowed with singular instincts, and performs actions worthy of our admiration; yet the beaver is not more sagacious than the ant or the bee, creatures far removed from it in every respect, neither are its moral qualities better than those of the common rat. Each, according to its instinct, provides for the safety and support of itself and offspring, each obeys the impulse of a power beyond its own control, and each remains through countless generations the same in point of intelligence;—untaught, incapable of teaching, and as well qualified to perform all the singular actions of its predecessors, if removed at the earliest age from its kind, as if it had grown to maturity in their midst, and aided in their operations from the time its strength became sufficient to the task.

After rejecting the exaggerated facts, as well as the numerous fictions relative to this animal, ample scope will still remain for the exercise of our admiration; for although the beaver is in no respect exclusively wonderful, yet its character and habits are such as to render it highly interesting. We shall therefore give a plain, unvarnished statement of facts obtained from the most authentic sources, and afterwards present some sketches of what, although frequently repeated in books of acknowledged authority, may be termed the *fabulous history* of the animal. This will prove serviceable as well as amusing,

as it will lead the inexperienced to receive wonderful narrations of the intelligence, &c. of animals, with enough of scepticism to prevent them from being betrayed into error.

The general aspect of the beaver, at first view, would remind one of a very large rat, and seen at a little distance it might be readily mistaken for the common musk-rat. But the greater size of the beaver, the thickness and breadth of its head, and its horizontally flattened, broad and scaly tail, render it impossible to mistake it for any other creature when closely examined. In its movements, both on shore and in the water, it also closely resembles the musk-rat, having the same quick step, and swimming with great vigour and celerity either on the surface, or in the depths of the water.

In a state of captivity or insulation, the beaver is a quiet or rather stupid animal, evincing about as much intelligence as a tamed badger, or any other quadruped which can learn to distinguish its feeder, come when called, or grow familiar with the inmates of the house where it is kept. It is only in a state of nature that the beaver displays any of those singular modes of acting which have so long rendered the species celebrated: these may be summed up in a statement of the manner in which they secure a sufficient depth of water to prevent it from being frozen to the bottom, and their mode of constructing the huts in which they pass the winter.

They are not particular in the site they select for the establishment of their dwellings, but if in a lake or pond where a dam is not required, they are careful to build where the water is sufficiently

deep. In standing waters, however, they have not the advantage afforded by a current for the transportation of their supplies of wood, which, when they build on a running stream, is always cut higher up than the place of their residence, and floated down.

The materials used for the construction of their dams are the trunks and branches of small birch, mulberry, willow, poplar, &c. They begin to cut down their timber for building early in the summer, but their edifices are not commenced until about the middle or latter part of August, and are not completed until the beginning of the cold season. The strength of their teeth and their perseverance in this work, may be fairly estimated by the size of the trees they cut down. Dr. Best informs us that he has seen a mulberry tree, eight inches in diameter, which had been gnawed down by the beaver. We were shown, while on the banks of the Little Miami river, several stumps of trees, which had evidently been felled by these animals, of at least five or six inches in diameter. These are cut in such a manner as to fall into the water, and then floated towards the site of the dam or dwellings. Small shrubs, &c. cut at a distance from the water, they drag with their teeth to the stream, and then launch and tow them to the place of deposite. At a short distance above a beaver-dam the number of trees which have been cut down appears truly surprising, and the regularity of the stumps which are left might lead persons unacquainted with the habits of our animal to believe that the clearing was the result of human industry.

The figure of the dam varies according to circumstances. Should the current be very gentle, the dam is carried nearly straight across; but when the stream is swiftly flowing, it is uniformly made with a considerable curve, having the convex part opposed to the current. Along with the trunks and branches of trees they intermingle mud and stones, to give greater security, and when dams have been long undisturbed and frequently repaired, they acquire great solidity, and their power of resisting the pressure of water and ice is greatly increased by the willow, birch, &c. occasionally taking root, and eventually growing up into something of a regular hedge. The materials used in constructing the dams are secured solely by the resting of the branches, &c. against the bottom, and the subsequent accumulation of mud and stones, by the force of the stream or by the industry of the beavers. In various parts of the western country, where beaver are at present entirely unknown, except by tradition, the dams constructed by their labours are still standing securely, and in many instances serve instead of bridges to the streams they obstruct. There are few states in the Union in which some remembrance of this animal is not preserved by such names as *Beaver-Dam*, *Beaver-Lake*, *Beaver-Falls*, *&c.*

The dwellings of the beaver are formed of the same materials as their dams, and are very rude, though strong, and adapted in size to the number of their inhabitants. These are seldom more than four old and six or eight young ones. Double that number have been occasionally found in one of the lodges, though this is by no means a very common occurrence.

When building their houses, they place most of the wood crosswise and nearly horizontally, observing no other order than that of leaving a cavity in the middle. Branches which project inward are cut off with their teeth and thrown among the rest. The houses are by no means built of sticks first and then plastered, but all the materials, sticks, mud and stones, if the latter can be procured, are mixed up together, and this composition is employed from the foundation to the summit. The mud is obtained from the adjacent banks or bottom of the stream or pond near the door of the hut. Mud and stones the beaver always carries by holding them between his fore paws and throat.

Their work is all performed at night, and with much expedition. When straw or grass is mingled with the mud used by them in building, it is an accidental circumstance, owing to the nature of the spot whence the latter was taken. As soon as any part of the material is placed where it is intended to remain, they turn round and give it a smart blow with the tail. The same sort of blow is struck by them upon the surface of the water when they are in the act of diving.

The outside of the hut is covered or plastered with mud late in the autumn, and after frost has begun to appear. By freezing it soon becomes almost as hard as stone, effectually excluding their great enemy, the wolverene, during the winter. Their habit of walking over the work frequently during its progress, has led to the absurd idea of their using the tail as a trowel. The habit of flapping with the tail is retained by them in a state of captivity, and, un-

less it be in the acts already mentioned, appears designed to effect no particular purpose. The houses, when they have stood for some time, and been kept in repair, become so firm from the consolidation of all the materials, as to require great exertion and the use of the ice-chisel or other iron instruments to be broken open. The laborious nature of such an undertaking may easily be conceived, when it is known that the tops of the houses are generally from four to six feet thick at the apex of the cone. HEARNE relates having seen one instance in which the crown or roof of the hut was more than eight feet in thickness.

The door or hole leading into the beaver-hut is always on the side farthest from the land, and is near the foundation of the house, or at a considerable depth under water. This is the only opening into the hut.

The large houses are sometimes found to have projections of the main building thrown out, the better to support the roof, and this circumstance has led to all the stories of the different chambers or apartments in beaver-huts. But these larger edifices, so far from having several apartments, are either double or treble houses, each part having no communication with the other, except by water. Upwards of twelve such dwellings have been seen under one roof, and, excepting two or three of them, the whole of the remainder had no communication unless by water, each having its own door into the dam, which is doubtless well known to the inmates, who may have comparatively little intercourse with each other. It is a fact that the

musk-rat is sometimes found to have taken up his abode in the huts of the beaver; the otter also occasionally intrudes his company. The latter animal, however, is a dangerous guest, for, if provision grow scarce, it is not uncommon for him to devour his host.

The northern Indians believe that the beaver always thicken the northern walls of their houses much more than the others, in order more effectually to resist the cold. In consequence of this belief, these Indians always break into the huts from the south side.

All the beavers of a community do not co-operate in the fabrication of houses for the common use of the whole. Those which are to live together in the same hut, labour together in its construction, and the only affair in which all seem to have a joint interest, and upon which they labour in concert, is the dam, as this is designed to keep a sufficient depth of water around all the habitations.

In situations where the beaver is frequently disturbed and pursued, all its singular habits are relinquished, and its mode of living changed to suit the nature of circumstances, and this occurs even in different parts of the same rivers. Instead of building dams and houses, its only residence is then in the banks of the stream, where it is now forced to make a more extensive excavation, and be content to adopt the manners of a musk-rat. More sagacity is displayed by the beaver in thus accommodating itself to circumstances, than in any other action it performs. Such is the caution which it exercises to guard against detection, that were it not for the removal

of small trees, the stumps of which indicate the sort of animal by which they have been cut down, the presence of the beaver would not be suspected in the vicinity. All excursions for the sake of procuring food are made late at night, and if it pass from one hole to another during the day time, it swims so far under water as not to excite the least suspicion of the presence of such a voyager. On many parts of the Mississippi and Missouri, where the beaver formerly built houses according to the mode above described, no such works are at present to be found, although beaver are still to be trapped in those localities. The same circumstances have been remarked of the European beaver, which has been thought to belong to another species, because it does not build. This, however, as may readily be inferred from what we have just stated, is no test of difference of species.

These animals also have excavations in the adjacent banks, at rather regular distances from each other, which have been called *washes*. These excavations are so enlarged within, that the beaver can raise his head above water in order to breathe without being seen, and when disturbed at their huts, they immediately make way under water to these washes for greater security, where they are more readily taken by the hunters, as we shall presently discover.

The beaver feeds principally upon the bark of the aspen, willow, birch, poplar, and occasionally the alder, but it rarely resorts to the pine tribe, unless from severe necessity. They provide a stock of wood from the trees mentioned, during the summer season, and place it in the water opposite the entrance to

their houses. They also depend in a great degree upon the large roots (of the *nuphar luteum,*) which grow at the bottom of the lakes, ponds and rivers, and may be procured at all seasons. It is remarked that these roots, although they fatten the beaver very much, impart a rank and disagreeable taste to their flesh.

The number of young produced by the beaver at a litter is from two to five. Females have been killed in which six young were found, but this occurred only in two instances out of many hundreds examined at different stages of gestation.* During the season of union, the voice of both sexes resembles a groan, the male having a much hoarser note than the female. The young beavers whine in such a manner as closely to imitate the cry of a child. Like the young of most other animals they are very playful, and their movements are peculiarly interesting, as may be seen by the following anecdote, related in the narrative of Capt. FRANKLIN's perilous journey to the shores of the Arctic Sea.—"One day a gentleman, long resident in the Hudson's bay country, espied five young beavers sporting in the water, leaping upon the trunk of a tree, pushing one another off, and playing a thousand interesting tricks. He approached softly, under cover of the bushes, and prepared to fire on the unsuspecting creatures, but a nearer approach discovered to him such a similitude betwixt their gestures and the infantile caresses of his own chil-

* Hearne.

dren, that he threw aside his gun and left them unmolested."

The beaver is a cleanly animal, and always leaves the house to attend to the calls of nature; the excrement being light, rises to the top of the water and soon separates and disappears. Thus, however great may be the number of individuals occupying the hut, no accumulation of filth of this kind occurs.

The beaver swims to considerable distances under water, but cannot remain for a long time without coming to the surface for air. They are therefore caught with greater ease, as they must either take refuge in their vaults or washes in the bank, or seek their huts again for the sake of getting breath. They usually, when disturbed, fly from the huts to these vaults, which, although not so exposed to observation as their houses, are yet discovered with sufficient ease, and allow the occupant to be more readily captured than if he had remained in the ordinary habitation.

To capture beavers residing on a small river or creek, the Indians find it necessary to stake the stream across to prevent the animals from escaping, and then they try to ascertain where the vaults or washes in the banks are situated. This can only be done by those who are very experienced in such explorations, and is thus performed:—The hunter is furnished with an ice-chisel lashed to a handle four or five feet in length; with this instrument he strikes against the ice as he goes along the edge of the banks. The sound produced by the blow informs him when he is opposite to one of these vaults. When one is discovered, a hole is cut through the

ice of sufficient size to admit a full-grown beaver, and the search is continued until as many of the places of retreat are discovered as possible. During the time the most expert hunters are thus occupied, the others with the women are busy in breaking into the beaver-houses, which, as may be supposed from what has been already stated, is a task of some difficulty. The beavers, alarmed at the invasion of their dwelling, take to the water and swim with surprising swiftness to their retreats in the banks, but their entrance is betrayed to the hunters watching the holes in the ice, by the motion and discolouration of the water. The entrance is instantly closed with stakes of wood, and the beaver, instead of finding shelter in his cave, is made prisoner and destroyed. The hunter then pulls the animal out, if within reach, by the introduction of his hand and arm, or by a hook designed for this use, fastened to a long handle. Beaver-houses found in lakes or other standing waters offer an easier prey to the hunters, as there is no occasion for staking the water across.

Among the Hudson's bay Indians every hunter has the exclusive right to all the beavers caught in the washes discovered by him. Each individual on finding one places some mark, as a pole or the branch of a tree stuck up, in order to know his own. Beavers caught in any house are also the property of the discoverer, who takes care to mark his claim, as in the case of the washes.*

* Lewis and Clark relate an instance which fell under their observation of one beaver being caught in two traps belonging to different owners, it having one paw in each. The

The number of beavers killed in the northern parts of this country is exceedingly great, even at the present time, after the fur trade has been carried on for so many years, and the most indiscriminate warfare waged uninterruptedly against the species. In the year 1820, sixty thousand beaver skins were sold by the Hudson's bay company, which we can by no means suppose to be the whole number killed during the preceding season. If to these be added the quantities collected by the traders from the Indians of the Missouri country, we may form some idea of the immense number of these animals which exist throughout the vast regions of the north and west.

It is a subject of regret that an animal so valuable and prolific should be hunted in a manner tending so evidently to the extermination of the species, when a little care and management on the part of those interested might prevent unnecessary destruction, and increase the sources of their revenue. The old beavers are frequently killed within a short time of their littering season, and with every such death from three to six are destroyed. The young are often killed before they have attained half their growth and value, and of necessity long before they have contributed to the continuance of their species. In a few years, comparatively speaking, the beaver has been exterminated in all the Atlantic and in the

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proprietors of the traps were engaged in a contest for the beaver, when the above named distinguished travellers arrived and settled the dispute between them by an equitable arrangement.

western states, as far as the middle and upper waters of the Missouri; while in the Hudson's bay possessions they are becoming annually more scarce, and the race will eventually be extinguished throughout the whole continent. A few individuals may, for a time, elude the immediate violence of persecution, and like the degraded descendants of the aboriginals of our soil, be occasionally exhibited as melancholy mementos of tribes long previously whelmed in the fathomless gulf of avarice.

The Indians inhabiting the countries watered by the tributaries of the Missouri and Mississippi, take the beavers principally by trapping, and are generally supplied with steel-traps by the traders, who do not sell, but lend or hire them, in order to keep the Indians dependant upon themselves, and also to lay claim to the furs which they may procure. The name of the trader being stamped on the trap, it is equal to a certificate of enlistment, and indicates, when an Indian carries his furs to another trading establishment, that the individual wishes to avoid the payment of his debts. The business of trapping requires great experience and caution, as the senses of the beaver are very keen, and enable him to detect the recent presence of the hunter by the slightest traces. It is necessary that the hands should be washed clean before the trap is handled and baited, and that every precaution should be employed to elude the vigilance of the animal.

The bait which is used to entice the beavers is prepared from the substance called castor (*castoreum,*) obtained from the glandulous pouches of the

male* animal, which contain sometimes from two to three ounces. This substance is called by the hunters *bark*-stone, and is squeezed gently into an open mouthed phial.

The contents of five or six of these castor bags are mixed with a nutmeg, twelve or fifteen cloves, and thirty grains of cinnamon, in fine powder, and then the whole is stirred up with as much whiskey as will give it the consistency of mustard prepared for the table. This mixture must be kept closely corked up, and in four or five days the odour becomes more powerful; with care it may be preserved for months without injury. Various other strong aromatics are sometimes used to increase the pungency of the odour. Some of this preparation, smeared upon the bits of wood with which the traps are baited, will entice the beaver from a great distance.

The castor, whose odour is similar to tanner's ooze, gets the name of *bark*-stone from its resemblance to finely powdered bark. The sacks containing it are about two inches in length. Behind these, and between the skin and root of the tail, are found two other oval cysts, lying together, which contain a pure strong oil of a rancid smell.

During the winter season the beaver becomes very fat, and its flesh is esteemed by the hunters to be excellent food. But those occasionally caught in the summer are very thin, and unfit for the table. They lead so wandering a life at this season, and are so much exhausted by the collection of materials

* Juxta preputium utroque latere existunt.

for building, or the winter's stock of provision, as well as by suckling their young, as to be generally at that time in a very poor condition. Their fur during the summer is of little value, and it is only in winter that it is to be obtained in that state which renders it so desirable to the fur-traders.

The different appearances of the fur, caused by age, season, disease, or accident, has at times led individuals to state the existence of several species of beaver in this country. No other species, however, has yet been discovered, but that whose habits we have been describing. Beavers are occasionally found nearly of a pure white, which is owing to the same cause that produces albino varieties of various animals. A specimen of the albino beaver may be seen in the Philadelphia Museum; HEARNE saw but one such specimen during a residence of twenty years in the Hudson's bay country. This was considered a great curiosity, and no other was afterwards procured there during the ten ensuing years, notwithstanding he offered a large reward to the Indians for as many of the same colour as they could procure.

The traits of character exhibited by the beaver in captivity are not very strikingly peculiar, though sufficiently interesting. It learns to obey the voice of its master, is pleased to be caressed, and cleanly in its habits. HEARNE states that he has kept various individuals about his house during his residence at Hudson's bay, and remarks, "they made not the least dirt, though they were kept in my own sitting room, where they were the constant companions of the Indian women and children, being

so fond of their company that when the Indians were absent for any considerable time, the beaver discovered great signs of uneasiness, and on their return showed equal marks of pleasure by fondling on them, crawling into their laps, laying themselves on their backs, sitting erect like a squirrel, and behaving to them like children that see their parents but seldom. In general during the winter they lived on the same food as the women did, and were remarkably fond of rice and plumb-pudding. They would eat fresh venison and partridges very freely, but I never tried them with fish, though I have heard they will at times prey on them."*

Fabulous History of the Beaver.

This part of our subject is richer in materials than any other which comes within the scope of our work. We have in the beginning adverted to the grand

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* "It is well known that our domestic poultry will eat animal food: thousands of geese that come to London market are fattened on tallow craps, and our horses in Hudson's Bay would not only eat all kinds of animal food, but also drink freely of the wash or pot-liquor intended for the hogs. We are assured by the best authorities, that in Iceland not only black cattle, but also the sheep, are almost entirely fed on fish and fish-bones during the winter season. Even in the isles of Orkney, and that in the summer, the sheep attend the ebbing of the tide as regularly as the Eskimaux curlew, and go down to the shore which the tide has left to feed on the sea-weed. This, however, is through *necessity*, for even the famous island of Pomona will not afford them an ex-

source of error in this and other departments of natural history, but there is one circumstance peculiar to the history of the beaver, which has thrown over it more delusion than in the case of almost any other animal. The fur-traders, Indian interpreters, and Indians themselves, have furnished the greater part of the information which we possess of the habits and manners of this animal. To these persons the beaver is a most important object, and regarded with a degree of admiration and superstition exactly proportioned to their ignorance. Hence they have in numerous instances been led to magnify facts actually observed, and to state their own notions of the sagacity of the animal as realities, not intending to deceive, although they have deceived themselves. To become acquainted with the peculiarities of a species both nocturnal and exceedingly timid and vigilant, requires years of patient and assiduous attention. It is not surprising, therefore, that persons seeking information should resort to those who are devoted to the pursuit of the animal, and receive their statements given with seriousness and minute detail as worthy of credit. In addition to the errors which spring from the ignorance of these observers, there is a worse evil to which inquirers are exposed. The traders, hunters, and interpre-

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istence above high-water mark."—*Hearne*, 8vo. *p.* 245. It must always be borne in mind that observations made on the diet of captive animals, will not at all apply to them when they are free to follow the dictates of nature. It is, however, highly interesting to know how far they can accommodate themselves to necessity.

ters have, for various reasons, considerable jealousy of all those who are too inquisitive about their peculiar concerns, and it is an occurrence of almost daily repetition, that when they are questioned on these subjects, they take a malicious pleasure in palming, with truly Indian gravity and patience, the most false and marvellous relations upon their auditor.

This is frequently done with so much art as by no means to outrage probability, and the whole is made to appear so consistent, and is to the eager inquirer so highly interesting, as to prevent him for a moment from supposing that the whole is an extempore fable. We have been informed by an ear-witness on one such occasion, that he was astonished to hear a trader giving a long account, full of the most extraordinary and interesting particulars, of the habits of the beaver, to an ardent inquirer, who was writing it down with great delight. As soon as the collector of notes on natural history had retired, after listening to the whole story with the most unsuspecting confidence, the other inquired of the trader how it happened that he never had before given this information, which he must have known would have been so very acceptable. The answer to this question was a roar of laughter, and an assurance that there was not a word of truth in the whole statement; but that, having been exceedingly annoyed by the inquisitiveness of the individual, he had chosen to get rid of him at once by appearing to tell him all he knew.

As the reader is already in possession of all the well attested facts to be procured in illustration of its habits and character, we may safely present a few

of the marvellous relations which have been heretofore given of the beaver, leaving him to separate the great mass of fiction from the few truths with which they may be mingled. We therefore begin with the most ancient of these fictions, and come down to the latest writers who have contributed to the perpetuation of such erroneous views.

"The castor, or beaver, when in the rivers, feeds upon shell fish and such other prey as it can catch. This variety of food is the reason why its hinder parts, to the ribs, have the taste of fish, and that they are eaten upon fast days, and all the rest has the taste of flesh, so that it is not used at other times.

"It has pretty large teeth, the under standing out beyond their lips about three fingers breadth; the upper about half a finger, being very broad, crooked, strong and sharp, growing double, very deep in their mouths, bending circular, like the edge of an axe, and are of a yellowish red. They take fishes upon them as if they were hooks, being able to break in pieces the hardest bones. When he bites he never loses his hold until his teeth meet together. The bristles about their mouths are as hard as horns; their bones are solid and without marrow; their fore-feet are like a dog's, and their hinder like a swan's. Their tail is covered over with scales, being, like a soal, about six inches broad and ten inches long, which he uses as a rudder to steer with when he swims to catch fish; and though his teeth are so terrible, yet when men have seized his tail they can govern the animal as they please.

"The beavers make themselves houses of square timber, which they gnaw down with their teeth al-

most as even as if they were sawed, and almost as equal as if it were measured. They lay these pieces across, and each is let down by large notches into the other, so that, having dug a hole for their foundation, they build several stories, that they may rise higher or lower, according to the fall of water."*

"Amongst the beavers some are accounted masters, some servants. They are cleanly in their houses; for the making of which, they draw the timber on the belly of their ancients, they lying on their backs."†

"While some are engaged in cutting down large trees for the dam, others traverse the vicinity of the river and cut smaller trees, some as thick as one's leg, and others as large as the thigh. They trim these and gnaw them in two at a certain height to make stakes: they bring these pieces first by land to the edge of the stream, and there float them to the dam: they then form a sort of close piling, which is still farther strengthened by interlacing the branches between the stakes. This operation supposes many difficulties vanquished; for to prepare these stakes, and place them in a nearly perpendicular situation, they must raise the large end of the stake upon the bank of the river, or against a tree thrown across it, while others at the same time plunge into the water and dig a hole with their fore-feet for the purpose of receiving the point of the stake or pile, in order to sustain it erect. In pro-

* Pomet, Hist. of Drugs.
† Lemery.

portion as some thus plant the piles, others bring earth, which they temper with their fore-feet and beat with their tails; they carry it in their mouths and with their fore-feet, and convey so large a quantity that they fill all the intervals of the piling. This pile work is composed of several ranges of stakes of equal height, all planted against each other, extending from one side of the river to the other: it is piled and plastered throughout. The piles are planted vertically on the side next the water-fall; the whole work is sloping on the side sustaining the pressure, so that the dam, which is ten or twelve feet wide at base, is only two or three feet thick at the summit. It has therefore not only all the solidity necessary, but the most convenient form for raising the water, preventing it from escaping, sustaining its weight, and breaking its violence. At the top of the dam, that is at the thinnest part, they make two or three sloped openings for the discharge of the superfluous water, and these are enlarged or closed up as the river swells or diminishes, &c.

"It would be superfluous after such an exposition of their public works, to give a detail of their private edifices, if in a history it were not necessary to relate *all* the *facts*, and if this first great work were not done with a view to render their little dwellings more commodious. These dwellings are cabins or rather little houses, built in the water on close piles, near the edge of the pond, having two doors or issues, one on the land and the other on the water side. Sometimes they are found to have two or three stories, the walls being as much as two feet thick, elevated perpendicularly upon the piles which

serve at the same time for the foundation and floor of the house, &c. The walls are covered with a sort of stucco, so well tempered and so properly applied, that it appears as if it had been done by human hands. Their tail serves them as a trowel for applying this mortar, which they temper with their feet, &c.

"These retreats are not only very secure, but also very neat and commodious; the floor is strewed with verdure; boughs of box and fir serve for a carpet, upon which they never leave the least dirt. The window which looks out upon the water serves them for a balcony for the enjoyment of the air, or to bathe during the greater part of the day. They sit with the head and anterior parts of the body elevated and the posterior plunged in water; the opening is sufficiently elevated never to be closed by the ice, which, in the climates where the beavers reside, is sometimes three feet thick; they then lower the shelf by cutting the piles upon which it rested aslope, and make an opening into the water below the ice!!

"The habit which they have of continually retaining the tail and hinder parts in the water, appears to have changed the nature of their flesh. Thus the fore parts, as far as to the loins, has the quality, taste and consistence of land animals; that of the thighs and tail has the odour, savour, and all the qualities of fish; this tail, a foot long, an inch thick, and five or six broad, is really an extremity, a true portion of a fish attached to the body of a quadruped.

"However admirable, or marvellous the statements we have made on the labours and society of

the beaver may appear, we dare to say that no one will doubt their reality.* All the relations made by different witnesses, at various times, agree together as to the facts we have related; and if our statement differ from some among them, it is only at points where they have swelled the marvellous, surpassed the truth, and even transcended probability!†

"Beavers are most industrious animals: nothing equals the art with which they construct their dwellings. They choose a small piece of ground with a rivulet running through it. This they form into a pond by making a dam across, first by driving into the ground stakes five or six feet long, placed in rows, walling each row with pliant twigs, and filling the interstices with clay, ramming it down close."‡

"They have a chief or superintendant in their works, who directs the whole. The utmost attention is paid to him by the whole community. Every individual has his task allotted, which they undertake with the utmost alacrity. The overseer gives a signal, by a certain number of smart slaps with his tail, expressive of his orders. The moment the artificers hear it they hasten to the place thus pointed out, and perform the allotted labour, whether it is to carry wood, or draw the clay, or repair any acci

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* O! magnus posthac inimicis risus!—Uterne
Ad casus dubios fidet sibi certius? Hor. *Serm. lib. ii.*

† Buffon ed. Somini, vol. xxvi. p. 102.

‡ Pennant's History of Quadrupeds. The whole of the observations in that work on the habits of the beaver are transcribed from Buffon.

dental breach. They have also their centinels, who, by the same kind of signal, give notice of any apprehended danger. They are said to have a sort of slavish beaver among them (analogous to the drone) which they employ in servile works and domestic drudgery."*

"In 1792, Capt. G. Cartwright published a journal of transactions, &c. on the Labrador coast, where he had resided nearly sixteen years. In this he apprises the reader that his account will appear *very different* from what Buffon and others have written on the subject, and begs it may be remembered that they wrote chiefly from hearsay, but what he advances is the result of his own actual observation."†

Yet, with a very trifling exception, this actual observer repeats all the trash of preceding *hearsay*-writers, nearly in their own words, only expressing doubts about the tail being used as a trowel, or a sledge upon which they haul stones and clay. The following is his version of Buffon's account of the solitary or hermit beaver: "Sometimes a single beaver lives by itself, and is then called a *hermit* or *terrier*. Whatever may have been the cause which has separated these individuals from society, it is certain that they always have a black mark on the inside of the skin upon their backs, which is called a saddle, and distinguishes them from the others. Cartwright supposes this separation from society may arise from their fidelity and constancy to each other,

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* Pennant's Arctic Zoology, p. 117. vol. i.
† Church's Cabinet of Quadrupeds.

and that, having by some accident lost their mate, they will not readily pair again. He thinks, likewise, that the mark on the back may proceed from the want of a companion to keep that part warm."*

"Three beavers were seen cutting down a large cotten-wood tree: when they had made considerable progress one of them retired to a short distance and took his station in the water, looking steadfastly at the top of the tree. As soon as he perceived the top of the tree begin to move towards its fall, he gave notice of the danger to his companions, who were still at work, gnawing at its base, by slapping his tail upon the surface of the water, and they immediately ran from the tree out of harm's way."†

"It is difficult for a traveller to publish his travels without speaking of the beaver, although he should have travelled only in Africa, where there are none. I should wish to avoid repetition, but I have no recollection of what those gentlemen individually, even Buffon from his closet, have written. I will communicate what I have seen and learned on the spot, respecting this surprising animal. If I say the same that others have said, it will serve to con-

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* Church, Cab. Quad. Bachelors of the human species have good cause to rejoice that their backs are clothed, if Capt. Cartwright's doctrine holds good throughout, otherwise their forlorn condition would be at once indicated by something like the aforesaid *saddle*.

† Long's Exped. to the Rocky Mountains, vol. i. p. 464. It is but just to state that this is given in that work as a "*hunter's story*," which is too often synonymous with an English word of three letters.

firm you the more in what you already know, if there should be any thing new, you will be obliged to me for adding to your stock of information.

"On the west side a small stream enters the lake. The beavers have barricaded the mouth of it, by means of a causeway, which a regiment of engineers could not have made better; the water is thrown back and forms a pond, where they have erected their town. It must be observed that they know that this river is never dry; for otherwise, they would not have chosen it.

"The stakes planted in the earth, and the trunks of trees which cross them, are of a considerable thickness and length. It is incredible how this little animal could transport such enormous pieces; but what is most astonishing, they never use trees thrown down by the wind or felled by men, but they make their own selection, and cut those which seem to them best adapted for their buildings.

"Whilst five or six of them cut or gnaw with their teeth at the foot of the tree, another remains in the middle of the river, and informs them, either by a whistle, or by a blow with his tail on the water, when he observes the top inclining, in order that, continuing not the less their labour, they may be cautious and remain on their guard. Observe, they never gnaw the tree on the land-side, but always on that next the water, in order that it may certainly fall in that direction.

"All the *tribes* then unite their efforts and float it to the place proposed. Then, with their teeth, they sharpen the stake, with their claws they make deep holes in the earth, and with their paws they

plant and drive it in. They place branches of trees crossways against these stakes, they then fill up the interstices with mortar, which some prepare, while others are cutting the trees, or are occupied with other labours,—for the tasks are so distributed that none remain idle. This mortar becomes harder and more solid than the celebrated cement known among the Romans.

"When the causeway is completed and they have tried it, in order to know if it answers their purposes, they work out at the lower part of it an opening, in the nature of a sluice, which they open and shut at need, in order to let the river flow again; they then begin to build their house in the midst of the ground destined to form the pond. They never build the house before the causeway, lest this last should not succeed according to their wishes, and they should thus lose their time and trouble.

"Their house, built likewise of wood, and plastered, is of two stories, and double. It is long in proportion to the number of the tribe which are to inhabit it.

"The first story serves them in common, as a magazine for provisions, and is under the water; the second is above, and serves them for lodging-rooms, where each family has its apartment.

"Under the foundation of the house they work out a number of passages, by means of which they enter and go out under ground, without being perceived even by the most vigilant Indian; these open at some distance from the house, and at that part which forms the pond, or at the lakes or rivers, near which they

commonly establish themselves, in order to have the choice of taking that direction which may be most convenient to them, or least dangerous in the different incidents of their life.

"The beavers are divided into tribes, and sometimes into small bands only, of which each has its chief, and order and discipline reign there, much more, perhaps, than among the Indians, or even among civilized nations.

"Their magazines are invariably provisioned in summer, and no one touches them before the scarcity of winter is felt, unless extraordinary circumstances render it absolutely necessary, but never in any case does any one enter except by the authority and in the presence of the chief. Their food consists in general of the bark of trees, principally that of willow, and of all the trees which belong to the poplar family. Sometimes when bark is not found in sufficient quantity, they collect the wood, and in this case they cut it into bits with their teeth.

"Each tribe has its territory. If any stranger is caught trespassing, he is brought before the chief, who for the first offence punishes him *ad correctionem*, and for the second deprives him of his tail, which is the greatest misfortune that can happen to a beaver, for their tail is their cart, upon which they transport, wherever it is desired, mortar, stones, provisions, &c. and it is also the trowel, which it exactly resembles in shape, used by them in building. This infraction of the laws of nations is considered among them as so great an outrage, that the whole tribe of the mutilated beaver side with him, and set off immediately to take vengeance for it.

"In this contest the victorious party, using the rights of war, drives the vanquished from their *quarters*, takes possession of them, and places a provisional garrison, and finally establishes there a colony of young beavers. With respect to this point, another particularity of these admirable animals will not appear less astonishing.

"The female of the beaver produces her young usually in the month of April, and has as many as four. She nourishes them, and carefully instructs them during a year, that is to say until the family is about to have another increase, and then these young beavers, obliged to give place, build a new dwelling by the side of the paternal mansion, if they are not very numerous, otherwise they are obliged to go with others in order to form elsewhere a new tribe and a new establishment. If then, at this time, the enemy is driven from his quarters, the victors, if their young of that year are arrived at the period of emancipation, (that is to say of governing themselves) instal them there. The Indians have related to me in a positive manner another trait of these animals, but it is so extraordinary that I leave you at liberty to believe or reject it. They assert, and there are some who profess to have been ocular witnesses, that the two chiefs of two belligerent tribes sometimes terminate the quarrel by single combat, in the presence of the two hostile armies, like the people of *Medieve*, or three against three, like the Horatii and Curiatii of antiquity. Beavers marry, and death alone separates them. They punish infidelity in the females severely, even with death.

"When they are sick, they are carefully nursed.

The sick have also their plaintive cries, like human beings. The Indians hunt them in the same manner in which, as you have seen in our sixth promenade, they hunt the musk-rat. The musk-rat is a beaver of the second degree. He has the same form in miniature, and many of his qualities, although his fur is inferior in beauty and fineness. The Indians, moreover, in winter make holes in the ice which cover the ponds surrounding the houses of the beaver, watch for the moment when they put out their heads to take the air, and shoot them.

"The Great Hare at Red Lake wished to make me believe that, having come to the spot where two tribes of beaver had just been engaged in battle, he found about fifteen dead or dying on the field, and other Indians, Sioux and Chippeways, have also assured me that they have obtained valuable booty in similar circumstances. It is a fact that they sometimes take them without tails. I have seen such myself. In fine, these animals are so extraordinary, even in the eyes of the Indians themselves, that they suppose them men, become beavers by transmigration, and they think in killing them to do them a great service, for they say they restore them to their original state."*

We may advantageously conclude the fabulous history of the beaver by introducing the judicious observations made on the subject by HEARNE, whose excellent remarks on this animal have been, hitherto, altogether overlooked.

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* Beltrami, La Decouverte des Sources du Mississippi, &c. 1825.

"I cannot refrain from smiling when I read the accounts of different authors who have written on the economy of these animals, as there seems to be a contest between them who shall most exceed in fiction. But the compiler of the Wonders of Nature and Art, seems in my opinion to have succeeded best in this respect, as he has not only collected all the fictions into which other writers on this subject have run, but has so greatly improved on them, that little remains to be added to his account of the beaver, besides a vocabulary of their language, a code of their laws, and a sketch of their religion, to make it the most complete natural history of that animal which can possibly be offered to the public.

"There cannot be a greater imposition, or indeed a grosser insult on common understanding, than the wish to make us believe the stories of some of the works ascribed to the beaver; and though it is not to be supposed that the compiler of a general work can be intimately acquainted with every subject of which it may be necessary to treat, yet a very moderate share of understanding would be sufficient to guard him against giving credit to such marvellous tales, however smoothly they may be told, or however boldly they may be asserted by the romancing traveller."*

Most of the wonders related of the beaver are to be found in Gesner's work, *De Quadrupedibus*, which contains a collection of all the statements made anterior to this time. These extravagances will be found, with slight variations, repeated down to the

* Octavo ed. 1790, p. 231.

present day, by Buffon and his successors. We subjoin a few of these, which it is unnecessary to translate, as specimens of the close repetition indulged in by various writers, who should have drawn more largely upon nature instead of aiding in the diffusion of fictions and error.

"Morsu potentissimum adeo ut cum hominem invadit, conventum dentium non prius laxet quam concrepuise persenserit ossa fracta: *Plin.* et *Solin.* Apud Gesnerum.

"Gaudent enim, ripis magnorum fluvium cum animal sit amphibium, non solum ut reliqua quibus hoc nomen tribuitur quæ victus tantum gratia aquas petunt, sed etiam quadam natura affinitate, ut jam in caudæ et pedum posteriorum mentione diximus quæ ad piscium naturam accedunt.

"Castores gregatim ad sylvas lignatum pergunt imponunt autem ligna super ventrem resupinati unius qui pro vehiculo sit et inter crura ejus artificiose componunt: qui ne delabantur compressis ea cruribus ante et retro stringit; hunc sic onustum ceteri cauda ad casas usque pertrahunt. Hanc injuriam fieri negant nisi peregrino castori qui aliunde ad eos confugerit aut fortuito pervenerit ad castores loci alicujus incolas: illum enim hoc pacto in servitutem ab eis redigi. Alii non peregrino sed natu grandi et laboribus confecto qui propter dentes obtusos lignis secandis ineptus jam sit, hoc fieri aiunt. Ita tractati castores in dorso glabrescunt, quo signo a venatoribus agniti illæsi interdum dimittuntur.—

"Falsum est quod agitatus a venatore castret seipsum dentibus ac testes projici at et postea si ab alio venatore urgeatur erecto corpore, castratum se os-

tendat, ut sæpe in regionibus nostris compertum est."—*Alb. Mag.**

Description of the Beaver.

The beaver is about two feet in length, having a thick and heavy body, especially at its hinder part. The head is compressed and somewhat arched at the front, the upper part being rather narrow, and the snout, at the extremity, quite so; the neck is very short and thick. The eyes are situated rather high up on the head, and have rounded pupils; the ears are short, elliptical, and almost entirely concealed by the fur. The whole skin is covered by two sorts of hair; one which is long, rather stiff, elastic, and of a gray colour for two-thirds of its length next the base, and terminated by shining, reddish, brown points, giving the general colour to the pelage; the other is short, very fine, thick, tufted and soft, being of different shades of silver gray or light lead colour. On the head and feet the hair is shorter than elsewhere. The tail, which is ten or eleven inches long, is covered with hair similar to that of the back, for about one-third of its length nearest the base, the rest of it is covered by hexagonal scales, which are not imbricated.†

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* "Imitatus castora, qui se Eunuchum ipse facit, cupiens evadere damno testiculorum." Juvenalis xii. hy. xxxiv.

† When the beaver sits erect upon its hinder limbs, as in the act of conveying his food to the mouth with his fore

The only species of beaver known is the one we have described; all the others which have been noticed are varieties of this species.

During the first year of their lives, the beavers are termed pappooses by the hunters; when two years old, small meddlers; at three years of age, large meddlers. In their fourth year they are called beavers, and after that old or great beavers.*

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paws, like the squirrel, the tail is doubled under, or thrown forwards, lying between the legs.

Castoris penis modo profecto singulari ab ano, copulandi gratia protensus est; dehinc inter ista, et *monotremata*, sive animalia unico communi que foramine prædita, similitudo.

It was our intention to have concluded the account of the beaver, by presenting a sketch of the history of the *American* fur trade, so intimately connected with this animal. But the difficulty of collecting the necessary data is so great, and our inquirers thus far have been so unproductive of satisfaction, that we are reluctantly obliged to defer our observations on this interesting subject until a future period.

CHAPTER III.

Genus XXI. Musk-Rat; *Fiber*; Ill.

Germ. Zibethratze: Bisambiber; u. s. f. *Fr.* Rat Musqué.
Swed. Desmanarotta. *Eng.* Musk-Beaver.

GENERIC CHARACTERS.

The head is rather long and blunt at the snout, with eyes of a moderate size and short ears. The limbs are short, the anterior having four toes, not united, but bordered by a membranous edging somewhat fringed. All the toes are furnished with incurvated nails of moderate size. The tail is long, compressed, or flattened vertically, covered with a naked granulous integument, with a few hairs interspersed. The teats, which are six in number, are placed on the belly. A peculiar matter, having a strong musky odour, is secreted by glands situated in the pubic regions.

Dental System.

16 Teeth: { 8 Upper { 2 Incisive, 6 Molar. / 8 Lower { 2 Incisive, 6 Molar.

The teeth of this genus do not differ from those of the Campagnole Arvicola; *Lacep.* hereafter to be described, except in having distinct roots, and in

the lower jaw the first molar having two triangles, one on each side, more than the Arvicolæ.

Species I.—*Musk-Rat.*

Fiber Zibethicus.

Rat Musqué du Canada: Briss. Reg. An. p. 136.
Castor Zibethicus: L. Erxl. Bod.
Mus Zibethicus, Gmel.
Ondatra: Buff. x. pl. i.
Ondatra Zibethicus: Say, Long's Exped. to the Rocky Mountains.
Fiber Zibethicus: Sab. App. p. 659.
Musquash of the Traders and Indians.

The musk-rat, which is so closely allied in form and habits to the beaver, does not, like that timid animal, retire from the vicinities inhabited by man, but, relying on its peculiar instinct for concealment, remains secure, notwithstanding the changes induced by cultivation, and multiplies its species in the very midst of its enemies. Thus, while the beaver has long since entirely disappeared and become forgotten in the Atlantic states, the musk-rat is found within a very short distance of our largest and oldest cities,* and bid fair to maintain its place in such situations during an indefinite future period.

The musk-rat owes this security to its nocturnal and aquatic mode of life, as well as to the peculiar mode in which its domicile is constructed. Along small streams, mill-races and ponds, where the banks

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*Within a mile of Philadelphia, on every side, this animal may be found, along the banks of all the streams emptying into the Delaware and Schuylkill.

are of some elevation and strength, the musk-rats form large and extensive burrows. These have the entrance always in the deep water, so as to be entered or left without betraying the presence of the animal. The mouth of the burrow ascends from its commencement near the bottom, and slopes upwards until it is above the level of the high water. The burrow then extends to great distances, according to the numbers or necessities of the occupants. Like most other animals residing in such burrows, they frequently excavate them beneath the roots of large trees, where they are perfectly secure from being disturbed by having their burrow broken into from above.

The injuries done by the musk-rat to the banks thrown up to exclude the tide from meadows and other grounds, are frequently very extensive. The tide encroaches more and more on the burrow as the soil softens and is washed away; the animals extend their excavations in various directions, in order to free themselves from the inconvenience of the water, and at length, from the co-operation of both causes, the bank caves in and the water is allowed free access, often laying waste the most valuable parts of the farm. To understand the extent to which such mischief may be carried, it is sufficient to take a walk along the banks thrown up to protect the meadows on the Delaware, on both sides of the river. Similar, though not as extensive injury, is produced along the borders of ponds, races and small streams, by the caving in of the burrows formerly tenanted by the musk-rat.

Where musk-rats frequent low and marshy situa-

tions, they build houses, which, in form and general appearance, resemble those made by the beaver. These edifices are round, and covered at top in form of a dome, and are built of reeds, flags, &c. mingled with mud. Instead of one place of entrance and exit there are several subterraneous passages, leading in different directions, and as these are extensive, the musk-rats when disturbed take refuge in them. Numerous individuals, composing several families, live together during the winter season; but, in the warm weather the house is entirely deserted, and the musk-rats live in pairs and rear their young, of which they have from three to six at a litter.

The musk-rat builds in a comparatively dry situation, at least not in a stream or pond of water, but in the marsh or swamp. He requires no dam, and does not, like the beaver, lay up a stock of winter provision, neither does he erect so strong and durable a dwelling, as it is not to be repaired, but deserted for a new one the following season.

Speaking of the musk-rat, as observed by him in the Hudson's Bay country, HEARNE remarks, that "instead of making their houses on the banks of ponds or swamps, like the beaver, they build on the ice, as soon as it is skinned over, and at a considerable distance from the shore, always taking care to keep a hole open in the ice to admit them to dive for their food, which consists chiefly of the roots of grass. The materials made use of in building their houses are mud and grass, which they bring up from the bottom. It sometimes happens in very cold winters that the holes in their houses freeze over, in spite of all their efforts to keep them open. When

that is the case, and they have no provision left in the house, the strongest prey upon the weakest, till by degrees only one is left in a whole lodge. I have seen several instances sufficient to confirm the truth of this assertion: for when their houses were broke open, the skeletons of seven or eight have been found and only one entire animal. Though I have before said that they generally build their houses on the ice, it is not always the case: for in the southern parts of the country, particularly about Cumberland House, I have seen, in some of the deep swamps that were over-run with rushes and long grass, many small islands that have been raised by the industry of those animals, on the tops of which they had built their houses like the beaver, some of which were very large. The tops of these houses are favourite breeding places for the geese, which bring forth their young brood there without the fear of being molested by foxes, or any other destructive animal, except the eagle."

The musk-rat feeds upon the roots, &c. of aquatic plants, and is especially fond of the acorus verus, or calamus aromaticus, which grows abundantly in most of the marshy vicinities inhabited by the musk-rat. It has been imagined that this animal feeds also upon fish, merely from its habit of living much in the water. There is the same reason for believing that the beaver is piscivorous, an opinion which the structure of the teeth, stomach and intestines of both animals, sufficiently contradict.

The musk-rat is an excellent swimmer, dives well, and remains for a considerable time under water. It is rare to have an opportunity of seeing the animal

during the day time, as it lies concealed in its burrow, but by watching during moonlight nights, in situations not much frequented by human visitors, the musk-rat may be seen swimming in various directions, and coming on shore for the sake of seeking food, or for recreation.

The musk-rat has its nose thick and blunt at the end, and short ears, nearly concealed in fur. Its body and head very much resemble those of the beaver, but differ from it in colour, being a reddish brown. The belly and breast are ash colour, mingled slightly with ferruginous. The feet and tail of the musk-rat are also remarkably different from those of the beaver; all the toes are free and unconnected. On the hinder, instead of a web uniting the toes, there is a stiff fringe of bristly hair, closely set and projecting from the sides of the toes. The tail is thin at the edges, compressed so as to be vertically flattened, covered with small scales, having a slight intermixture of hair, and is about nine inches long, being nearly of the length of the body, which measures about twelve inches from the end of the nose to the root of the tail. The powerful odour of musk renders the flesh of the musk-rat of little value, and few can eat it. The skin is highly valued on account of the fineness of its fur.*

* "The musk-rat is never seen in Carolina, Georgia, or Florida, within one hundred miles of the sea coast, and very few in the most northern parts of these regions; which must be considered as a most favourable circumstance by the people in countries where there is so much banking and draining of the land, they being the most destructive creatures to dykes."—*Bartram's Travels, p.* 281.

CHAPTER IV.

Genus XXII. Field Mouse; *Arvicola;* Lacep.

Germ. Feldmaus: Heerdenmaus: u. s. f.
Fr. Campagnol: Rat des champs.
Ital. Topo Terrajuolo: Campagnuolo.
Swed. Molle.

GENERIC CHARACTERS.

The animals belonging to this genus are in general appearance very similar to the common rat, have a rudiment of a thumb on the anterior feet, and the toes of these feet armed with slender nails. The posterior feet have five toes, provided with nails, and destitute of connecting membrane, or fringing of hairs on their edges. The teats, which vary in number from eight to twelve, are situated on the chest and belly. The tail is nearly of the length of the body, round, and covered by a velvet-like tegument.

Dental System.

16 Teeth: { 8 Upper { 2 Incisive, 6 Molars. / 8 Lower { 2 Incisive, 6 Molars.

This system of dentition is composed of small triangles, surrounded by enamel, and disposed alternately on each side of a common axis, so that there is a

triangular vacancy between each of them, that forms a deep groove on the outside of the tooth.

In the upper jaw the incisors are even, and slightly rounded on their anterior surface. The first molar is composed of five triangles,—one anterior, two external, and two internal, and these correspond to the interval left between the others, so that they are closer than those of the anterior triangle. The second is composed of four triangles, one anterior, two external and two on the inner side, corresponding to the vacant spaces which separate the two others. The third is composed also of four triangles, one anterior, one external, one internal, and one posterior; the latter is irregular, being narrow, elongated, and the lines forming it sinuous. These three teeth diminish gradually in size, from the first to the last.

In the lower jaw the forms of the teeth are the same as in the upper: the incisors are even, and slightly rounded on the anterior surface. The first molar has five angles, or rather five divisions; the first is in form of a trefoil, then come two small internal triangles, an external and a posterior larger than the middle ones. The second is also composed of five triangles: one small anterior, two internal, one exterior and one posterior. The third appears to have only three or four triangles, placed nearly one behind the other, and joined by their angles.

Species I.—*The Meadow-Mouse.*

Arvicola Xanthognatus; Leach.

Arvicola Xanthognatus: Sabine, App. p. 660. Say, Long's Exped. to the Rocky Mountains, i. 369.
Campagnol aux joues fauves: Desm. Mammal. p. 282.

Were we to confine our attention to an individual of this species, its diminutive size, delicacy of limbs and evident feebleness, might lead us to consider it as altogether insignificant, and equally incapable of benefitting or injuring mankind. In this, as in various analogous instances, nature has compensated for individual feebleness by numerical force, and endowed this species with a fecundity which not only preserves it amidst numerous vigilant and destructive enemies, but enables it to multiply so extensively as to become a severe tax, and occasionally a scourge to the farmers.

The meadow-mouse is found in various degrees of abundance throughout this country, and, as implied by its name, prefers the meadow and grass fields to other situations. The banks of drains, and those thrown up to keep off the tide, or overflow of streams, are the favourite places for their burrows, which are both numerous and extensive, being continued in various directions and to considerable depths. These burrows are frequently causes of injury similar to that resulting from those of the musk rat, the tide gradually enlarging the cavities, and the bank finally falling in, until a fair breach is made, through which the grounds are injuriously inundated.

During the temperate and warm seasons of the year, the meadow-mice spend the greater part of their time above ground, travelling about through little lanes and alleys among the grass. These small roads are so frequently travelled, that after the hay-harvest, when they are left exposed, they have something of the appearance of little burrows among the grass-roots. At the season of the first hay-harvest their nests are found in great numbers on the surface of the ground. These are made very similar to a small bird's nest, of soft grass, and generally contain six or eight young ones. Recollecting that this species breeds more than once a year, we shall find no difficulty in understanding how the meadow-mice may become very injurious by excessive multiplication, notwithstanding their defenceless condition and numerous enemies. Besides being preyed upon by owls, hawks, cats, &c. the country people are very vigilant in putting them to death, and the hay-makers consider mouse hunting as one of the most enlivening circumstances connected with their labours.

Thus far the mischief of which the species is notoriously guilty, appears not to be compensated by any peculiar good quality; but although we are unable to state the precise degree of service rendered, the fact of its existence is sufficient evidence of importance in the great scale of creation, whatever difficulty there may be in discovering or acknowledging it. No doubt this, among other species, was destined to limit the undue increase of the vegetable kingdom; various other creatures in an analogous manner subsist by the destruction of meadow-mice, while the great destroyer man seems to be the last

in the chain of destructiveness, since he is not only in the habit of extinguishing vegetable and brute animal life, but of extending his ravages to his own kind.

The general colour of this species is a reddish yellow, mingled with black on the upper part of the body, and a clear cinereous gray beneath. The sides of the head are fulvous; the tail is black above and white beneath; the paws are brownish on their superior surface, and white beneath. Its length, including the tail, is about five inches.

Species II.—*The Marsh Campagnol.*

Arvicola Riparius; Ord.

Arvicola Riparius: Ord. Journal of the Academy of Natural Sciences, iv. part ii. p. 305.

This species, like the preceding, makes its burrows in the meadow banks, and resembles it in various other respects. All that we know of it is derived from the account given by Mr. Ord, in the work above quoted.

"This species (says he,) is fond of the seeds of the wild-oats (*zizania aquatica,*) and is found in the autumn in those fresh water marshes which are frequented by the common rail, (*Gallinula Carolina Lath.*) When the tide is high the animal may be observed sitting upon the fallen reeds, patiently waiting for the recession of the water. From its position when at rest it has much the appearance of a lump of mud, and is commonly mistaken for such

by those who are unacquainted with its habits. It swims and dives well."

The head of the marsh campagnol is large, with a thick obtuse snout,—having small eyes and short roundish ears, nearly concealed by the hair on the cheeks. The fore legs are very short; the posterior parts of the body are more slender and weaker than the anterior. The tail is thinly covered with hair, and tufted or penciled at tip, and is longest in the male. The upper parts of the body are of a tawny brown colour mixed with black, the lower parts of an ash or gray colour. The female has four pectoral and four abdominal teats, and brings forth eight young at a litter.

SPECIES III.—*The Cotton-Rat*, or *Hairy Campagnol.*

Arvicola Hispidus; ORD.

Sigmodon Hispidum: SAY & ORD, Journal of the Academy of Natural Sciences, iv. part ii. p. 354.

This animal was discovered in East Florida in the year 1818, by Mr. Ord, whose description was not published until 1825. He found its burrows in the deserted plantations lying on the river St. Johns, East Florida, especially in the gardens, where they are seen in every direction. It is highly probable, he thinks, that this animal will be found a source of much injury and vexation to the future settlers of that country.

The head of the hairy campagnol is thick, and the snout elongated, having eyes of considerable size, and large round ears; the tail is nearly as long as the body. The ears are slightly covered with hair; the fore legs are short; the hind feet are large and strong, with short lateral toes and stout claws. The upper parts of the body and head are of a pale, dirty, yellow ochre colour, mixed with black; the lower parts are cinereous. On the upper parts of the body and sides the hair is long, plentiful and coarse. The animal is six inches long from the tip of the snout to the insertion of the tail, which is four inches long. In the adult animal yellow is the predominant colour; the young are generally black.*

The cotton-rat obtains its name from the circumstance of making its nest with cotton, which it collects for the purpose in large quantities; the nest is generally placed within a hollow log, or else in a chamber at the extremity of a burrow.

Species IV.—*The Wood-Rat.*

Arvicola Floridanus: Ord.

The Wood-Rat. Bartram, Travels in E. Florida, p. 124.
Mus Floridanus: Say, Long's Exped. to the Rocky Mountains, i. p. 51.
Neotoma Floridana: Say and Ord, Journ. of the Acad. of Nat. Sciences, iv. part ii. p. 342.

This beautiful animal was once thought to be peculiar to Florida, and received its scientific name from that circumstance. But it is now highly pro-

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* See note at the end of the next species.

bable that it is to be found throughout this country in certain situations; by Say it was obtained on the Missouri.

From all that we can learn relative to this animal, it is of a gentle, timid disposition; harmless in its manners and inoffensive in its mode of living. Far from having any of that peculiar cunning and distrustful air that is so remarkable in the common rat, it shows few signs of fear when approached, and allows itself to be made prisoner or killed without difficulty. They burrow under stones and among the ruins of buildings, and feed on vegetable substances. They construct their nests with large quantities of brush and rubbish.

The wood campagnol is about sixteen inches long, including the tail, which measures seven inches. The head gradually diminishes in size from the ears to the snout, and is of a lead colour intermingled with gray. Its ears are nine-tenths of an inch long, rounded, prominent and open, having but few hairs on their back part and on the margin within. The eyes are of a moderate size and prominent; the whiskers are arranged in six longitudinal series, the longest of them surpassing the tips of the ears. The tail is hairy and brown above; the legs are stout and of nearly equal length, with white feet, having the toes annulated beneath, and the nails concealed by the hair. The thumb is minute, and the palms of the fore feet have five tuberculous prominences; in the soles of the hind feet there are six tubercles, of which the three posterior are distant from each other.

"The wood-rat (says Bartram,) is a very curious

animal; they are not half the size of the domestic rat, and of a dark brown or black colour; their tail slender and shorter in proportion, and covered thinly with short hair. They are singular with respect to their ingenuity and great labour in the construction of their habitations, which are conical pyramids about three or four feet high, constructed with dry branches, which they collect with great labour and perseverance, and pile up without any apparent order, yet they are so interwoven with one another, that it would take a bear or wild cat some time to pull one of these castles to pieces, and allow the animals sufficient time to secure a retreat with their young."*

The wood-rat has, beyond doubt, been as common throughout this country at a former period, as it is at present in Florida and on the Missouri.† It has very universally given place to the black-rat, and both have disappeared before the Norway rat, as we

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* Page 125.

† "In turning over some of the baggage we caught a rat somewhat larger than the common European rat, and of a lighter colour; the body and outer part of the legs as well as the belly, feet and ears, are white; the ears are not covered with hair, and are much larger than those of the common rat; the toes are also longer; their eyes black and prominent; the whiskers very long and full; the tail rather longer than the body, and covered with fine fur and hair, of the same size with that on the back, which is very close, short and silky in its texture. This was the first we had met, although its nests are frequent among the clifts of rocks and hollow trees, where we also found large quantities of the shells and seeds of the prickly pear, on which we conclude they chiefly subsist."—*Lewis and Clarke, i. p.* 289.

shall soon have occasion to state. The wood-rat soon learns to infest the houses of the settlers, and to do nearly if not quite as much mischief as the common rat. It is highly probable that some of these rats still remain in the remote and barren parts of the Atlantic states, or in situations analogous to those occupied by this species in the southern and western country.*

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* In the Journal of the Academy of Natural Sciences, (vol. iv. part ii. p. 345, 352,) Messrs. Say and Ord propose to establish two new genera for the reception of this and the preceding species, under the names of *Sigmodon* and *Neotoma*, in consequence of the differences they have observed in the dentition of these animals. These differences are the following: In the hairy campagnol (*arvicola hispidus**) "the different arrangement of the folds of the enamel, and the circumstance of the molars being divided into radicles, certainly exclude it from the genus arvicola." In relation to the wood-rat (*arvicola Floridanus*†) they remark, "that the grinding surface of the molars differs somewhat from that of the molars of the genus arvicola, but the large roots of the grinders constitute a character essentially different." With due deference to the opinion of our respected friends, we are decidedly of an opposite belief. This variation of dental arrangement may be sufficient to indicate modifications or differences in the regimen or feeding of these animals, but cannot of themselves suffice to establish generic distinctions, when the external characters and habits of the animals are so strikingly similar to the genus arvicola. The wood-rat certainly is closely related to the genus *mus*, and

* Sigmodon Hispidum of Say and Ord.

† Neotoma Floridana of Say and Ord. We have, as in all similar instances, referred the species to the original proprietors or describers, notwithstanding the changes produced by arranging them under other genera.

CHAPTER V.

Genus XXIII.—Lemming; *Lemmus;* Link, Cuv.

This genus is closely allied to the preceding, and differs from it principally in the conformation of the fore feet and the shortness of the tail. The fore feet are five toed in some instances, and four toed in others, being provided with nails fit for burrowing; the hind feet are five toed. The tail is not very acute at its extremity, is shorter than the body, and covered by a velvety integument.

The *dental system* is the same as that of the genus Arvicola.

Species I.—*The Hudson's Bay Lemming.*

Lemmus Hudsonius.

Lemmus Hudsonius: Sabine, App. p. 661.
Mus Hudsonius; Pallas, Glires, p. 208. pl. 26.
Rat de Labrador: Encycl. pl. 60, fig. 6.
Lemming de la Baie d'Hudson: Desm. Mammal. p. 289.
The Hair Tailed Mouse: Hearne, 8vo. ed. p. 395.

The Hudson's Bay Lemming is covered by a very fine, soft and long hair, which is of an ash colour,

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might with great propriety be considered as a distinct subgenus of arvicola, as Say and Ord suggest that some naturalists may consider it. The arrangement proposed by them

with a tinge of tawny on the back, having along its middle a dusky stripe, and on each side a pale tawny line. The limbs are quite short, and the fore feet being formed for burrowing, are very strong. The two middle claws of the male, which are compressed, thick and strong, appear to be bifid or double, because the skin of these toes is callous, and projects from beneath the nail.

The mode of life peculiar to this species is but little known; the Lapland lemming is very notorious for its extensive migrations, but nothing of the same kind has been observed of the Hudson's Bay species.

"The hair-tailed mouse, (says HEARNE) is the largest in the northern parts of the bay, being little inferior in size to a common rat. They always burrow under stones on dry ridges, are very inoffensive, and so easily tamed, that, if taken when full grown, some of them will in a day or two be perfectly reconciled, and are so fond of being handled that they will creep about your neck or into your bosom. In summer they are gray, and in winter change to white, but are by no means so beautiful as a white ermine. At that season they are infested with multitudes o small lice, not a sixth part so large as the mites in a cheese; in fact, they are so small that at first sight they only appear like reddish brown dust, but on closer examination are all perceived in motion. In

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we esteem to be in the highest degree artificial, unnatural, and by consequence unnecessary, and therefore not to be adopted, at least in a work in which nature and usefulness are the supreme objects of regard.

one large and beautiful animal of this kind, caught in the depth of winter, I found those little vermin so numerous about it, that almost every hair was covered with them as thick as ropes with onions, and when they approached near the ends of the hair they may be said to change the mouse from white to a faint brown. At that time I had an excellent microscope, and endeavoured to examine them, and to ascertain their form, but the weather was so exceedingly cold that the glasses became damp with the moisture of my breath before I could get a single sight. The hind feet of these mice are exactly like those of a bear, and the fore feet are armed with a horny substance,* (that I never saw in any other species of the mouse,) which is wonderfully adapted for scraping away the ground where they wish to take up their abode. They are plentiful on some of the stony ridges near Churchill factory, but never approach the house or any of the out-offices. From appearances they are very local, and seldom stray far from their habitations, even in summer, and in winter they are seldom seen on the surface of the snow—a great proof of their being provident in summer to lay up a stock for that season.†"

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* The description given of this "horny substance," which is a mere induration of the cuticle covering the palms, and caused by the act of scraping among the stones, &c. sufficiently indicates the species.

† "I observed with astonishment long ridges of mouse-dung, several inches deep, extending for above two miles. By what means this could have arrived here I was at a loss to conceive, as I did not see any mouse-holes or other traces of these animals; besides which they live in stony dry

CHAPTER VI.

Genus XXIV.—Rat; *Mus;* L.

GENERIC CHARACTERS.

The head is conical, more or less short, having a pointed snout, rather large eyes, and almost naked ears. There are no cheek pouches; the neck is short and the body thick, having from ten to twelve teats, part situated upon the chest and part upon the belly. The toes are free, or unconnected by membrane, and provided with hooked nails. The anterior feet have four digits and a rudimental thumb, covered by a blunt nail. The tail is naked, scaly and tapering; the body is covered by long, stiff hairs, intermingled with a close fine fur.

Dental System.

16 Teeth:
- 8 Upper.
  - 2 Incisive
  - 6 Molar.
- 8 Lower.
  - 2 Incisive
  - 6 Molar.

In the upper jaw the incisors are smooth and flat, and rise from the sides of the anterior part of

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places, and this was a swamp. It is possible, however, that this accumulation of the excrements of mice may be from the mus (*Lemmus.*) Hudsonius, occasionally migrating in the same wonderful manner as the lemmer of Lapland."—*Lyon's Private Journal, p.* 432.

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RATS.

1. Florida. 2. Pouched. 3. Water. 4. Common.

the maxillary bone. The three molars diminish in size from the first to the last; they are very remarkable for being inclined from before backwards. The first molar is composed of six tubercles, which, considered in a transverse order, present themselves thus:—two in front, one larger corresponding to the middle of the tooth, and the other at the inside; then three, two small ones on the edges, the largest in the middle, and finally one at the posterior part of the tooth, and of the size of the middle tubercle of the three preceding. This arrangement of the great tubercles in the middle, and of the small ones on the edge, gives the form of a trefoil to the undulating line they produce. The second molar is formed of four tubercles, one in front on the inside, two in the middle, arranged obliquely from without inwards, and from before backwards, and the fourth at the posterior part on the outside. The last has also four tubercles arranged like those of the second molar.

In the lower jaw the incisors are similar to those of the upper jaw; they arise far behind and above the molars, from the middle of the ascending branch of the jaw-bone, where its bulb produces a little projection. The molars diminish in size from the first to the third, and are inclined in a direction opposite to those of the upper jaw: that is, they lean forwards and are equally formed of tubercles. The first has five, one small anterior, two middle, and two posterior; the second has four, also arranged in pairs, two before and two behind. The last has but three, a single one in front, followed by a pair

Species I.—*The Common, Brown or Norway Rat.*

Mus Decumanus; Pall.

Mus Sylvestris: Briss. Reg. An. 170, No. 3; *Mus Norvegicus:* ibid. p. 173, No. 8.
Mus Decumanus: L. Gmel. Schreb. pl. 178, Encycl. pl. 67, fig. 9.
Le Surmulot: Buff. 8, pl. 27.
Brown-Rat: Penn. Quad. No. 298, Arct. Zool. i. 151, No. 57.

It must be confessed that this rat is one of the veriest scoundrels in the brute creation, though it is a misfortune in him rather than a fault, since he acts solely in obedience to the impulses of nature, is guided by no other law than his own will, and submits to no restraints except such as are imposed by force. He is, therefore, by no means as bad as the scoundrels of a higher order of beings, who, endowed with superior powers of intelligence, and enjoying the advantages of education, do still act as if they possessed all the villainous qualities of the rat, without being able to offer a similar apology for their conduct.

Among quadrupeds this rat may be considered as occupying the same rank as the crow does among birds. He is one of the most impudent, troublesome, mischievous, wicked wretches that ever infested the habitations of man. To the most wily cunning he adds a fierceness and malignancy of disposition that frequently renders him a dangerous enemy, and a destroyer of every living creature he can master. He is a pure thief, stealing not merely articles of food, for which his hunger would be a sufficient justification, but substances which can be of no possible

utility to him. When he gains access to the library he does not hesitate to *translate* and appropriate to his own use the works of the most learned authors, and is not so readily detected as some of his brother pirates of the human kind, since he does not carry off his prize entire, but cuts it into pieces before he conveys it to his den. He is, in short, possessed of no one quality to save him from being universally despised, and his character inspires no stronger feeling than contempt, even in those who are under the necessity of putting him to death.

The common, brown, or Norway rat, now so extensively diffused over this country, is not indigenous to our soil, but was introduced from Europe, which received it from Asia in the eighteenth century, as late as the year 1750. There are few parts of the world now visited by navigators where this animal has not been introduced, and the immediate consequence of its introduction has been, that all the native rats have been destroyed, or obliged to withdraw beyond the reach of this subtle and implacable enemy.

Prior to the year above mentioned this rat, now so notorious for its ravages, was almost, if not wholly, unknown in Europe.* It was conveyed to England,

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* Specie ob hoc (*ratto*) diversus, *mus decumanus*, Persia ut videtur et vicini orientis indigena, vix ante alterum tertiumve sæculi præteriti decennium Europæ invasisse fertur* et ubi agmina eorum consedere, domesticum contra *ratlum* sensim defecisse constat. *Norvegicum* plures nuperorum zoologicorum vocant quam vero appellationem Zimmermanus id improbat quod faunæ scandinaviæ nullam ejus men-

* R. Smith's Rat Catcher, p. 5, 1768.

about the period above mentioned, in the timber-ships from Norway, and hence it has received one of its common names. Many years subsequently it was brought to this country in European ships, and has been gradually propagated from the sea-ports over the greater part of the continent.

The brown rat takes up its residence about wharves, store-houses, cellars, granaries; &c. and destroys the common black rat and mouse, or entirely expels them from the vicinities it frequents. To chickens, rabbits, young pigeons, ducks, and various other domestic animals, it is equally destructive when urged by hunger and opportunity. Eggs are also a very favourite article of food with this species, and are sought with great avidity; in fact, every thing that is edible falls a prey to their voracity, and can scarcely be secured from their persevering and audacious inroads. In the country they take up their abodes according to convenience and the abundance of provision, infesting especially mills,

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tionem faciant. At enim vero hoc sane idoneis testibus evictum est ipsissimum hunc Rattum decimanum ante annum MDCCXXX. Anglis plane ignotum, tum temporis primum et quidem quod expresse asserunt, *ex Norvegia* navibus onerariis quæ lignorum materiam inde advehebant illatum esse. Cumque tum temporis in universa Germania boreali nullibi adhuc visus fuerat inficetum, corruit asseclarum petitoris quondam regni Anglici figmentum quo illum murem ex Hanoverianis terris in Brittanniam translatum esse fabulabantur.—*Jo. Frid. Blumenbach. Com. Soc. Goett.* 1283.

Southey's (Southey's) Letters, i. p. 285, ed.

barns and out-houses, or residing in holes along the banks of races or other water-courses.

The brown rat swims with great facility, and dives with vigor, remaining under water for a considerable time, and swimming thus to some distance. When attacked and not allowed an opportunity of escaping, he becomes a dangerous antagonist, leaping at his enemy and inflicting severe and dangerous wounds with his teeth. The most eager cat becomes immediately intimidated in the presence of one of these rats thus penned up, and is very willing to escape the dangers of an encounter.

The brown rat is amazingly prolific, and but for its numerous enemies, and its own rapacious disposition, would become an intolerable pest. Happily for the world, in addition to man, to the weazel, cat, some species of dog, &c. rats frequently find destructive enemies in each other, both in the adult and young state, their numbers thus being prevented from becoming such an intolerable grievance as they otherwise necessarily would. The strongest of the species prey upon the weaker, and are the most merciless destroyers of their own kind.* The weazel and the terrier are the most efficient rat-killers, as the first

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* "It is a singular fact in the history of these animals that the skins of such of them as have been devoured in their holes have frequently been found curiously turned inside out, every part being completely inverted to the ends of the toes. How the operation is performed it would be difficult to ascertain; but it appears to be effected in some peculiar mode of eating out the contents."—*Bewick, Hist. of Quadrupeds.*

can pursue the enemy to his most secret retreat, and the second derives from his superior strength and activity a very decided advantage in the contest. The cat, though in general a very useful auxiliary in lessening the number of this species, is very liable both to be foiled and worsted in her attempts. Bringing forth from twelve to eighteen at a litter, we have good reason to rejoice that so many animals have an instinctive animosity against so noxious a marauder.*

The cunning of these rats is not less than their impudence; it is almost impossible to take them in traps after one or two have been thus caught, as the rest appear perfectly to understand the object of the machine, and afterwards avoid it with scrupulous care, however tempting may be the bait it contains. The surest way to remove them is by poison, which, however, they frequently detect and avoid. The powder of nux vomica, mixed with some Indian corn or oat-meal, and scented with oil of rhodium, is found very effectual in destroying them. Arsenic is very commonly used in the same way for this purpose, but the fatal accidents which frequently occur when this poison is kept about the house, in consequence of the label being removed or changed, and the arsenic administered to members of a family instead of some other medicine, render it a very objectionable resource.

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* The name of this species, *decumanus*, was given on account of its great size, and is equally applicable to its great mischievousness. The word originally was decimanus, and eventually by custom became synonymous with magnus or great. See Callipœnus, Litleton, &c.

The brown rat measures about nine inches, and is of a light brown colour, intermingled with ash and tawny. The colour of the throat and belly is of a dirty white, inclining to gray. It has pale, flesh-coloured, naked feet, with a tail of the same length as the body, and covered with small dusky scales, with short hairs thinly scattered between.

Species II.—*The Black Rat.*

Mus Rattus; L.

Mus Rattus: Pall. Schreb. &c.
Mus Domesticus Major: Ray, Quad. Sp. 217.
Le Rat: Buff. 7, pl. 36.
Black Rat: Penn. Quad. ii. p. 176. Arct. Zool. i. p. 150.

This rat was much more common previous to the introduction of the brown rat than at present. It is now found only in situations to which the brown rat has not extended its emigrations, and is almost as injurious and destructive, resembling it closely in manners and habits. It is of a deep iron gray, and indeed nearly of a black colour above, and of an ash colour on the lower parts of its body. Its legs are nearly naked, and on its fore feet instead of the rudimental thumb it has a claw. The length from the nose to the root of the tail is seven inches; the tail itself is almost eight inches long.

It has been a matter of dispute, whether this animal was received here from Europe, or was originally taken hence to that quarter of the world. Blumenbach, who has devoted much attention to the subject, states it as his opinion that the black rat was

carried from Europe to America.* Garcilasso de la Vega states, that it was first introduced into South America by the Europeans, about the year 1544, and Geraldus Cambrensis speaks of them in Europe previous to the discovery of America.

Species III.—*The Common Mouse.*

Mus Musculus; L.

Mus Musculus: Erxl. Bod. Schreb. Ac.
Mus Domesticus Vulgaris: Ray, Quad.
Mus Sorex: Briss. p. 169, Sp. 2.
La Souris: Buff. viii. pl. 39, id. suppl. viii. pl. 20.

Like the two preceding species the Common Mouse is not an original inhabitant of this country,

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* De primigenio et patrio *Ratti* vulgariter *domestici* habitaculo, diversimodi disputatum est. Mirum videtur paradoxam Linnei opinionem, qui eum ex Indis occidentalibus in Europam advectum fuisse putarat, vel ipsi Pallasio ideo non improbabilem visam esse quod apud antiquos licet Musculi frequens, mentio nulla occurrat Ratti. Etsi enim nullus veterum, sive Græcorum sive Romanorum Rattum memoret, medii tamen ævi scriptores, iique de historia naturali perbene meriti, diu ante orbem novum detectum de *Ratto* nostrate agunt, in quibus egregius Silvester Geraldus anno MCLXXXVIII expresse *mures majores* nominat qui vulgariter Ratti dicuntur.* Probabile vero videtur huic Rattum primitus Europam mediam incoluisse donec occasione commerciorum et præsertim navigationem per universum quæ Europæis patet orbem adeo propagatus est ut quondam inter prodigia relatum sit nonnullos Germanicæ urbes eo plane caruisse.—*Blumenbach, Act. Soc. Gœtting.* v. 1823.

* Itinerar. Cambriæ.

but was brought here from Europe, and has long since become perfectly naturalized throughout the continent, having been conveyed in every direction by persons moving their household goods, even to the most remote frontier settlements.

The common mouse, from its size and feebleness, is to be regarded rather as a troublesome than a very injurious inmate of our dwellings, but always likely to effect much mischief on account of its fecundity, which is full as remarkable as that of any of its kindred species.* It is a timid and vigilant creature, yet confides to a considerable extent in its swiftness and watchfulness, coming out after various trials, and stealing about a room even when there are several persons present, provided they are silent and do not move.

The mouse makes a nest very similar to that of a bird, having the inside lined with some soft material, such as wool, cotton, &c. and brings forth her young several times during a year, generally from six to ten at each litter. At birth her offspring are naked and helpless, but in about fifteen days they are able to shift for themselves, and the mother is soon at liberty to prepare for another family.

The mouse is a very beautiful little animal, when seen not alarmed and at perfect liberty. Its long and

* "The propagation of mice, (μυες) in comparison with that of other animals, is very remarkable both for quickness and profuseness. A pregnant female was shut up in a chest of grain; in a short time a hundred and twenty individuals were counted."—*Aristotle, Hist. of Animals, Book vi. chap. 37.*

slender whiskers, which extend in numerous and graceful lines from around the fore part of the head, its bright prominent eyes, delicate ears, and slight limbs, with its peculiar movements in search of food, or while sporting with its companions, are all such as to render it a pleasing and interesting animal. It is generally, however, viewed with great disgust on account of prejudices connected with its mischievousness, and the peculiar smell which is more or less prevalent in the places where the species is most numerous.

The common mouse has frequently been tamed, and exhibits a considerable degree of attachment to its feeder. Instances are on record of prisoners who have amused themselves by feeding one of these little animals, until it has become quite tame, and appeared immediately, whenever called by its master. Among other circumstances connected with the history of the mouse, it is generally rumoured that this animal is peculiarly susceptible to impressions produced by music, and some very wonderful accounts have been published on the subject. The following story may serve as a specimen of the manner in which *facts* may be stated with perfect accuracy, and yet *conclusions* entirely unfounded be thence deduced. It is related by a gentleman who heard it from another "of undoubted veracity."

"One evening, in the month of December, as a few officers on board of a British man of war, in the harbour of Portsmouth, were seated around the fire, one of them began to play a *plaintive* air on the violin. He had scarcely performed ten minutes when a mouse, apparently frantic, made its appearance in

the centre of the floor, near the large table which usually stands in the ward-room, the residence of the lieutenants in ships of the line. The strange gestures of the little animal strongly excited the attention of the officers, who, with one consent, resolved to suffer it to continue its singular actions unmolested. Its exertions now appeared to be greater every moment. It shook its head, leaped about the table, and exhibited signs of the most extatic delight. It was observed that in proportion to the gradation of tones to the soft point, the extacy of the animal appeared to be increased, and *vice versa*. After performing actions which an animal so diminutive would at first sight seem incapable of, the little creature, to the astonishment of the delighted spectators, suddenly ceased to move, fell down and expired, without evincing any pain."*

Of the truth of this narration we are thoroughly satisfied, but we should explain it differently. The mouse, under the influence of disease, and almost in the agonies of death, came out of its hole when the musician was performing, and after struggling for a time, until exhausted by convulsions, died. The inferences of its "extacy," &c. are, for any thing to the contrary contained in the above account, entirely gratuitous, and we are much mistaken if the filing of a saw, the scraping of a gridiron, or the whetting of a scythe, would not in this instance have been accompanied by a similar degree of "extacy" in proportion as the

* Barton's Medical and Physical Journal, i. p. 38.

"gradation of the tones" approached the "soft point."

The common mouse is about three inches and a-half long, and has a long, nearly naked tail. Its colour varies considerably, but is generally of an ashy brown. It has four digits on its anterior feet, and a rudimental thumb, destitute of a claw: the hind feet are five toed. The mouse is preyed on by cats, weazels, owls, rats, &c. &c.

Species IV.—*The Rustic Mouse.*

Mus Agrarius; Gmel.

Mus Agrarius: Gmel. Pall. p. 341. Say, Long's Exped. to the Rocky Mountains, p. 369.

This little mouse is very common throughout this country, and is found in great abundance in places favourable to their multiplication. They are occasionally very injurious to the farmers by the destruction of the small grain, the heads of which they cut off and convey to their subterranean hoards, which differ very little, if at all, from those made by the meadow-mouse or campagnol.

The rustic mouse is about three inches long, and has a streak of a mixed dusky and ferruginous colour along the back: the spaces between the ears (which are large, open and naked) and sides are of an orange colour, while the whole of the under parts of the body, legs and feet, are of a pure white; the tail is dusky above and whitish beneath. The whiskers are long, and some of the hairs are white, some black.

CHAPTER VII.

Genus XXV.—Pouched-Rat; *Pseudostoma;* Say.

GENERIC CHARACTERS.

The head and body are large, giving to the animal a clumsy appearance; the cheek-pouches are very extensive, situated outside of the mouth, separated therefrom by the common integuments, and are profoundly concave, opening downwards, towards the mouth. The legs are short, the fore feet large and armed with very long claws; the hind feet are small.

Dental System.

20 Teeth: { 10 Upper { 2 Incisive, 8 Molar. / 10 Lower { 2 Incisive, 8 Molar.

In the upper jaw the incisors, always exposed to view, are strong and truncated in their entire width at tip, marked by a deep longitudinal groove near the middle, and by a smaller one at the inner margin. The molars, eight in number, penetrate to the base of their alveolæ without separating into roots, as in the genera *Arvicola Lepus, &c.* having simply discoidal, transversely oblong, oval crowns, margined by enamel, resembling in general form the molars of the genus Lepus, but without

the appearance of either a groove at their ends or of a dividing crest of enamel. The posterior tooth is rather more rounded than the others, and that of the upper jaw has a small prominent angle on its posterior face; the anterior tooth is double, in consequence of a profound duplicature in its side, so that its crown presents two oval disks, of which the anterior one is smaller, and the lower one somewhat angulated. All these teeth incline obliquely backward, thus resembling those of the preceding genus.

In the lower jaw the teeth are similar to those in the upper, except that the molars are inclined forwards.*

Species I.—*The Pouched-Rat.*

Pseudostoma Bursarium; Say.

Pseudostoma Bursaria: Say, Long's Exped. to the Rocky Mountains, i. 406.
Canada Rat: Shaw, Gen. Zool. ii. part i. p. 100.
Mus Bursarius: Linn. Trans. v. p. 227, pl. 8.
Mus Saccatus: Mitchill, New York Med. Rep. Jan. 1821. Lewis and Clark, ii. 180.
Cricetus Bursarcus: Desm. Mammal. 312.

[*Vulgarly called Salamander; Pouched-Rat; Sand-Rat; &c.*]

The pouched-rat, though long since noted by various observers, is still but little known, even in the vicinities where it is most common. Its peculiar mode of life, its nocturnal habits and vigilance,

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* This dental system, &c. is from Say. See Long's Expedition to the Rocky Mountains, i. p. 407.

unite to secure it from the view of incidental observers, and those who are desirous of becoming acquainted with this rat in a state of nature, must be prepared to exercise the most untiring patience as well as the most assiduous attention.

In Florida, Georgia, &c., and the plains adjacent to the Missouri, the pouched-rat is to be found in great numbers; their burrows are exceedingly numerous in various places, and give an appearance to the plains similar to that produced by ploughing. Over their burrows, hillocks of loose earth are raised, resembling in some respects those thrown up by the shrew-mole. These hillocks consist of about ten or twelve pounds of loose earth, which appears as if it had been emptied out of a flower-pot on the spot; no hole is to be discovered under this mass of loose soil, but if it be carefully removed, it is seen that the earth has been broken in a circle of an inch and a-half in diameter, within which space the ground is loose, but still without any distinct opening.

This species is rendered peculiar in its appearance by the cheek-pouches exterior to the mouth, its short fore legs and long claws. By the aid of the latter the animal is enabled in a light soil to burrow with great rapidity, and is seldom or never dug out, since it can escape through the ground as fast as one person can dig in pursuit.

As the pouched-rat is so entirely subterranean in its mode of life, it is not surprising that very little should have been learned of its history; neither can we hope that our knowledge will be much increased on the subject until some one, who is sufficiently acquainted with natural history, will devote himself

assiduously to the investigation of the manners of this animal in its native haunts. Except the slight notices given by Bartram, Lewis & Clark, and Say, nothing satisfactory on the habits of the pouched-rat has yet been published.*

The pouched-rat is covered by a reddish brown hair, which is lead-coloured at base; on the under parts of the body the colour is somewhat paler; the feet are white. The eyes are black; the ears scarcely prominent, and the cheek-pouches, which are hairy internally and externally, are very capacious. The whiskers are numerous, slender and whitish. The feet are five-toed, the anterior pair being robust, with large, elongated, somewhat compressed nails, exposing the bone on the inner side; the middle nail is much the longest, then the fourth, then the second, then the fifth, the first being very short. The hind feet are very slender, with nails concave beneath and rounded at tip, the exterior one being very small; the tail is short, hairy at base, and nearly naked at its tip.†

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*The figures which are given of this animal most commonly represent it with the cheek-pouches *inverted* in a most unnatural manner.

† Say, as above quoted.

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CHAPTER VIII.

Genus XXVI.—Jumping-Mouse; *Gerbillus;* Desm.

Generic characters.

The head is elongated, and the ears are rounded and of moderate size. The anterior extremities are short, have four digits, furnished with small nails and a rudimental thumb; the posterior limbs are either long or very long, have five digits, each of which is supported by a distinct metatarsal bone, and provided with a nail. The tail is long and covered by hair.

Dental System.

16 Teeth: { 8 Upper { 2 Incisive / 6 Molar. / 8 Lower { 2 Incisive / 6 Molar.

In the upper jaw the incisor, which arises from the middle part of the maxillary bone, is divided into equal parts by a longitudinal furrow. The molars diminish in size from the first to the last. The first is composed of three transverse prominences, formed by two intervening furrows, not so deep in the middle as at their extremities; these prominences are slightly depressed in the middle, but the anterior and posterior are narrower than the middle. The second molar is composed of two prominences, formed by an intervening depression, the posterior being

the narrowest. The third molar is similar to the second, but smaller, especially its posterior prominence. Hence these teeth differ from those of the Hamster (*Cricetus*) principally in the breadth of their prominences. When worn down these teeth are remarkably like those of the Hamster in the same condition. They present an even surface, with depressions on the internal and external edges, which are traces of the extremities of the furrows; the difference in the breadth of the prominences may still be recognized.

In the lower jaw the incisor is even; the molars diminish in breadth from the first to the last, the reverse of what we find in the hamster. The first molar has three prominences and two furrows, but the first is very narrow and almost circular. The second has two prominences and a furrow, and the third is so small as to be scarcely more than rudimental.

Species I.—*The Jumping-Mouse.*

Gerbillus Canadensis; Desm.

Dipus Canadensis: Davies, Linn. Trans. iv. 158.
Dipus Americanus: Barton, An. Philos. Trans. iv. 114.
Canadian Jerboa: Shaw, Gen. Zool. pl. 2d. i. 192.
Gerbille du Canada: Desm. Mammal. p. 132.

This little animal is very remarkable for the great length of its hind legs and its mode of progression, in both of which it bears some resemblance to the kanguroo of Australasia, and the jerboa of the old continent. When not in motion the jumping-mouse

might be mistaken for the common field-mouse, as its general aspect is very similar. To rectify such an erroneous view, it is sufficient that an attempt be made to capture it, when the force and celerity of its leaps soon remove it from danger, and the pursuer is astonished at seeing so small a creature, with very slight apparent effort, eluding his most eager speed, by clearing five or six feet of ground at every spring. When the jumping-mouse is pursued by one or two persons, and permitted to advance in one direction, its movements resemble those of a bird rather than a quadruped, so high does it leap into the air, so great is the distance it measures at every bound, and so light and quick is its ascent and descent. The jumping-mouse, however, does not exclusively move in this manner, but is capable of running on all its feet with considerable speed; hence it frequently excites the wonder of the country people, or gives them much labour in vain when they attempt to run it down.

The jumping-mouse is found in this country from Canada to Pennsylvania, and no doubt still farther south. It is in size nearly the same as the common mouse. The head, back, and upper parts of the body, generally, are of a reddish brown colour, somewhat approaching to yellow. On the back the brown is darker than elsewhere. The under parts of the body throughout are cream-colour, as well as the inner parts of all the limbs. Near the lower part of the nostrils there is a band or yellow streak, which runs on each side along the whole length of the head and the superior and inferior side of the fore limbs, whence, passing along the body, it terminates at the

joint of the thighs. The upper jaw projects considerably beyond the lower, and the nostrils are open. The ears are small, rather oval and hairy; the whiskers are long. The fore limbs are short, and have four digits, provided with long and very sharp nails; there is also a minute tubercle instead of thumb, which is entirely destitute of nail. The posterior extremities are very long, especially from the heel to the ends of the toes, which are five in number, long, slender, and the three middle ones nearly of equal length. The external and internal toes are much shorter; the inner one is shortest of all. The tail considerably exceeds the body in length, and gradually decreases in size from its origin to its extremity, being finely ciliated or clothed with hair throughout, and terminating with a fine pencil of hairs. On the upper side it is of a slate-brown colour, beneath it is of a yellowish cream-colour, and composed of very numerous joints.

The jumping-mouse is found in the grain and grass fields, like the other little plunderers heretofore described, and feeds on the same substances. It breeds very fast, and may occasionally become injurious to the farmer. It is not usual, however, to find them in great numbers in Pennsylvania, though in some vicinities they are quite common.

At the commencement of cool weather, or about the time the frost sets in, the jumping-mice go into their winter-quarters, where they remain in a torpid state until the last of May or first of June. They are dug up sometimes during winter from a depth of twenty inches, being curiously disposed in a ball of clay about an inch thick, and so completely coiled

into a globular form as to conceal the figure of the animal entirely.

Species II.—*The Labrador Jumping-Mouse.*

Gerbillus Labradorius; Sab.

Mus Labradorius: Sab. App. to Franklin's Exped. p. 661.
Labrador Rat: Penn. Quad. ii. 173, Arct. Zool.
Gerbillus Hudsonius: Rafin. Prodr. de Somiol.

This species, which closely resembles the preceding in its mode of living, is found in the Labrador and Hudson's Bay country. It is about four inches in length, exclusive of the tail, which is two inches and a-half long. The general colour of the superior parts of the body is brown; of the inferior parts white. The front is very much arched or projecting, so that the nostrils present towards the earth. The mouth, which is far below, is small, with the upper lip bifid, and long black whiskers projecting in two tufts. The ears are rounded and situated far back on the head. The hind legs are an inch and a-half long, covered with short hair, and five-toed, the inner one being the shortest, the others nearly equal. The tail is covered with black hair above and white below.

CHAPTER IX.

Genus XXVII.—Marmot; *Arctomys;* Gmel.

Germ. Murmelthier. *Fr.* Marmotte.
Ital. Marmotto. *Swed.* Mormoldjuret.

GENERIC CHARACTERS.

The head, which is thick and flattened, has a blunt and somewhat compressed snout, with eyes of a moderate size, and short ears. The trunk of the body is thick, the limbs short, and the feet robust. The fore feet have four digits, not united by membrane, and a rudimental thumb. The posterior extremities have five digits, which are also free; all the toes are furnished with strong, hooked, compressed nails. The tail is short, or of moderate length, and covered with hair.

Dental System.

22 Teeth: 12 Upper { 2 Incisive, 10 Molar.. } 10 Lower { 2 Incisive, 8 Molar. }

In the upper jaw the incisive is rounded and smooth in front, and rises from the anterior and inferior part of the maxillary bone above the first molar. The first molar is a simple tubercle with one root; the three following, which are of the same size, are

divided transversely by two depressions, which produce three prominences; the first of these depressions traverses the tooth entirely, but the second is obstructed by a spine or internal spur, which unites the two posterior prominences. These teeth have three roots, two external and one internal. The last, or fifth, resembles the others, except in its posterior prominence, which is extended posteriorly in a sort of spur, which corresponds to the root analogous to the second external root of the preceding molars.

In the lower jaw the incisive is similar to that of the upper jaw, and rises below the last molar. The four molars are of equal size and entirely similar in form. They present a groove on their outside, on the inside a depression which comprises the whole width of the tooth, and at their antero-inferior edge a narrow and very salient tubercle, which diminishes in size from the first to the last. The first of these teeth has, besides, at its neck and on its anterior face, a hollow bordered by a small spine.

When these teeth are worn to a certain degree, all their projections disappear, and their crowns become entirely smooth; but both subsist during the whole life of the animal.

Species of this genus are found in various parts of the old continent, and in the Bahama islands. In this country the greater number of species are found far to the north. The habits of the genus are detailed at length in describing the following species.

Species I.—*The Maryland Marmot.*

Arctomys Monax; Gmel.

Bahama Coney: Catesby, Carolina, ii. 79. *Marmota Americana:* ibid. App. 28.
Monax, or Marmotte of America: Edwards, Nat. Hist. ii. 104.
Glis Fuscus; Marmota Bahamensis: Briss, Reg. An. 4to. 163. *Marmota Americana:* 4to. 164.
Maryland Marmot: Penn. Synops. 270. Quad. ii. 398. Arc. Zool. i. 111. Shaw's Zool. iii. 117.
Le Monax ou Marmotte du Canada: Buff. Hist. Nat. xiii. 136. Supp. iii. 175. pl. 28. Ed. Sonnini. xxxii. 22.

As the *Maryland* Marmot is no where more common than in Virginia, New Jersey, Pennsylvania, and indeed all the temperate parts of this country, we state the fact in commencing the history of this interesting species, to prevent readers from drawing the erroneous conclusion that the *name* is a correct indication of the *place* to which the animal exclusively belongs. In doing this we cannot refrain from once more expressing our unavailing regret that the importance of bestowing right names is still so little felt or understood, and that in heedless haste an original observer should be allowed permanently to establish designations, which uniformly betray the ignorant into error, and prove sources of vexation to all who feel their inappropriateness. The abuse of terms, however, has long been justly esteemed as one of the most abundant sources of human mistake and suffering, and if with all advantages of knowledge men persist in occasionally calling brutal rudeness by the name of *candour* and *bluntness*,—swaggering, *courage*,—and a destitution of good breeding and honesty, *imprudence*, the student of natural

history can scarcely expect that much attention will be paid to the evils he endures from the impediments thrown in his way by the same prolific source of mischief.

The scientific name of the genus to which the Maryland marmot belongs, is excellent, if the species now under consideration be taken in illustration, for a first glance at the animal is sure to bring to mind the idea of a bear and a rat, of both of which this creature is a curious miniature resemblance. The thickness of its body, entirely plantigrade walk, posture when engaged in listening, and heavy gait, are such as vividly to excite a recollection of the bear, while the form of the head, teeth, position and appearance of the eye, and general aspect, equally remind the observer of the rat. In some of its actions it more nearly resembles the squirrel, especially when in feeding it employs the fore paws, yet in this it also exhibits a marked similitude to the bear, as it frequently uses one paw at a time with the same awkward facility that appears so singular in bruin. Among the country people it bears the name of *woodchuck* and ground-hog, the latter being expressive of its habit of burrowing and peculiar voracity.

This marmot is the cause of great injury, especially to the farmers engaged in the cultivation of clover, as their numbers become very considerable, and the quantity of herbage they consume is really surprising. They are the more capable of doing mischief from the circumstance of their extreme vigilance and acute sense of hearing, as well as from the security afforded them by their extensive subterranean dwellings.

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When about to make an inroad upon a clover-field, all the marmots resident in the vicinity quietly and cautiously steal towards the spot, being favoured in their march by their gray colour, which is not easily distinguished. While the main body are actively engaged in cropping the clover-heads and gorging their ample cheek-pouches, one or more individuals remain at some distance in the rear as sentinels. These watchmen sit erect, with their fore-paws held close to their breast, and their heads slightly inclined to catch every sound which may move the air. Their extreme sensibility of ear enables them to distinguish the approach of an enemy long before he is sufficiently near to be dangerous, and the instant the sentinel takes alarm he gives a clear shrill whistle, which immediately disperses the troop in every direction, and they speedily take refuge in their deepest caves. The time at which such incursions are made is generally about mid-day, when they are less liable to be interrupted than at any other period, either by human or brute enemies.

The habitations of this marmot are formed by burrowing into banks, the sides of hills, or other similar situations, and are generally inclined slightly upwards from the mouth, by which the access of water is prevented. In forming the burrow, where the ground is soft, the fore paws are the principal agents; the strength of the animal's fore limbs is very great. Where the soil is hard and compact the long cutting teeth are very freely and efficiently employed, and we have been surprised to see large stones and lumps of hardened clay dug out in this way. As the burrow is deepened the earth is

brought out in the following manner:—The marmot first throws the earth, with his fore paws, under his belly, and when it has accumulated to a certain degree, he rests on his fore paws and kicks the dirt forcibly onwards with the hind ones, and thus going backwards to the mouth of his den he finally throws it to a considerable distance from the entrance. It is very easy to determine when one of these animals has been engaged in forming a new burrow, as his whiskers are worn close to the head, in proportion to the hardness of the soil in which he has worked, and his teeth and the edges of his upper lip show evident marks of the hard service they have performed. The paws are admirably adapted for burrowing, both on account of the length of the toes and nails, and the peculiar arrangement of the skin of the palms and soles of the feet, which is extended between the toes so as to make them distinctly semi-palmated or webbed, especially in the hind feet. This circumstance is not commonly noted by the writers on natural history, but we have repeatedly examined the living animal, and find the character uniformly present. That this structure has reference to burrowing is evident, as the animal shows a great repugnance to water, very seldom drinking, and then in but small quantity; he suffers exceedingly from exposure to rain.

The burrows extend to great distances under ground, and terminate in various chambers, according to the number of inhabitants. In these, very comfortable beds are made by the marmot, of dry leaves, grass, or any soft dry rubbish to be collected. It is really surprising to see the vast quantity of such ma-

terial an individual will cram into his mouth to carry off for this purpose. He first grasps with the teeth as much as he possibly can; then sitting erect, with both fore paws he stuffs the mass projecting on each side deeper into the mouth, and having arranged it satisfactorily, takes up successive portions, which are treated in like manner; during the whole time, the head is moved up and down to aid in filling the mouth to the very utmost. This is repeated until every fragment at hand is collected, and the whole transferred to the sleeping apartment, into which the marmot retires towards the decline of the day, and remains there until the morning is far advanced. At some seasons of the year this marmot is seen out on moonlight nights at a considerable distance from the burrow, either in search of better pasture or looking for a mate; on such occasions, when attacked by a dog, the marmot makes battle, and when the individual is full grown, his bite is very severe. The teeth of the dog give him vast superiority in the combat, as when once he seizes, he is sure of the hold until the parts bitten are torn through, while the marmot can merely pinch his fore teeth together, and must renew his attempts very frequently. The fight is also soon ended by the dog seizing the marmot by the small of the back, and crushing the spine so as to disable his antagonist effectually.

There is no animal so perfectly cleanly in its habits as this marmot; not only the fragments of its food and the litter of its bed are carefully removed, but the loose earth about the mouth of the burrow is carefully scraped away. However numerous they

may be in any vicinity, their excrement is not seen, nor any offensive odour perceived. Whenever the calls of nature are felt, this animal seeks a spot at some distance from his dwelling, and having dug a hole of two or three inches in depth, and performed his evacuations, he covers it up with extreme care, and not content with placing a thick layer of earth over it, he presses it, or rather rams it down with the end of his nose, striking with a force which seems very extraordinary when thus applied.

The Maryland marmot, as we have already mentioned, eats with great greediness and large quantities. To the wild animal red clover is a very favourite food, and, when it can be obtained, lettuce, cabbage, and various other garden vegetables. In captivity it eats of almost every vegetable offered, is exceedingly fond of bread and milk, and will display the most violent anger, by erecting its hair, growling and yelping, if it see a cat or other animal fed with this substance. One which we kept for a long time in a state of domestication, would, on such occasions, become almost furious, and never desist from his efforts until he had broken his chain, when he would rush to the spot, drive off the cat by a severe bite, or bite the person who attempted to withhold him from the dish. Yet on other occasions he did not interfere with the cats, even when feeding within his reach, though he would at any time bite them if they came immediately in his way. This marmot would eat the parts about the joints of the legs of fowls, when thrown to him, and occasionally a small piece of salt-fish,—but, as a general rule, refused animal food of every description.

This individual was very tame, playful and cunning, having the freedom of the yard, and the privilege of performing all his operations unmolested. He was very fond of being handled and petted, and would play with great good humour, though in a clumsy and awkward manner. Every thing fit to make a bed of, that he could get at, was sure to be carried under ground, and when clothes were missed, which had been hung out to dry, it was only necessary to fasten a hook to a long stick and draw them out of his burrow. When this was to be effected, it was necessary to tie the marmot up short, as he appeared to understand perfectly what was to be done, and was by no means willing that his bed should be rendered less comfortable. Although he would not attempt to bite the person engaged in removing his plunder, he would rush to the entrance and endeavour to make his way in, as if to secure his prize, or remove it to a still greater distance. On one occasion he carried off and stowed at a distance of six feet from the entrance, eight pairs of stockings, a towel, and a girl's frock, and had he not been discovered in the act, would have made a still larger transfer of materials to form a more luxurious bed.

In whatever action engaged, the vigilance of this animal was unceasing, and his ear appeared the sense almost exclusively relied on. By observing him closely it was evident that every variation of sound, however slight, or from whatever different sources, was immediately perceived. While earnestly engaged in eating, and making no inconsiderable noise in munching lettuce, or other crisp vegetables, the least noise would be sufficient to suspend his

hunger and excite all his vigilance, and if it were one to which he was unaccustomed, or loud enough to alarm him, he would run with great precipitation until he arrived at the edge of his hole, where he would sit up for an instant in an attitude of the profoundest attention, and either return to his food, or take refuge in his hole, as he might feel satisfied that there was or was not danger to be apprehended.

To look at the ear of this marmot without close examination, placed on the side of the head, high up and far back, with very little external cartilaginous projection, and a wide orifice leading to the internal ear, it would seem very inappropriate to the subterranean mode of life, since it appears to be so placed as to allow the dirt ready access. But no such inconvenience takes place, as the ear is provided with a muscular apparatus, by which the upper portion is brought down, and the sides of the lower portion are so accurately pressed against each other, as effectually to exclude the smallest particles of dirt or dust.

At the commencement of the cold weather the marmot goes into winter quarters; having blocked up the door from within, he there remains until the return of the warm season revives him again to renew his accustomed mode of life. The female produces five or six young at a litter.

The body of the Maryland marmot is about the size of that of a rabbit, and covered by long rusty brown hair, generally gray at the tips; the face is of a pale bluish ash-colour. The ears are short, but broad, and as if they had been cropped at their superior edges; the tail is about half the length of the body, and covered with dark brown hairs, somewhat

bushy at its extremity. The feet and claws are black; the claws are long and sharp.

All the figures which have been heretofore published of this animal, (with the exception of one given in the English translation of Cuvier, borrowed from a drawing by LESUEUR,) have been copied from Edwards', which is altogether unlike the animal.

SPECIES II.—*The Quebec Marmot.*

Arctomys Empetra: GM. SCHREB.

Marmotte du Canada: Encycl. pl. 67, fig. 4.
Quebec Marmot: PENN. Synopsis, 270, pl. 24, fig. 2, Quad. ii. 397, pl. 412, ed. 3, ii. 129, pl. 741. Arct. Zool. i. 111, Shaw's Zool. iii. 119.
Arctomys Empetra: SCHREB. Quad. 743, pl. 210. GMEL. Syst. Nat. i. 143. SABINE, App. to Franklin, p. 662. IBID. Trans. Lin. Society, xiii. 584.
Marmotte de Quebec: DESM. Nouv. Dict. d'Hist. Nat. xix. 514.

[*Called Siffleur by the Canadians.*]

The *Quebec* Marmot is found throughout the northern parts of this country, and in its habits closely resembles the preceding species. Its entire length, from the tip of the nose to the extremity of the tail, is about twenty-six inches, of which the tail forms six inches.

The general colour of the upper part of the body is grayish, the hairs being thus coloured; at the base they are dark, in the middle yellowish, near their tops black, and white at their tips; near the tail the white is not so remarkable. On the cheeks and chin the hair is short, and inclines to gray, on the nose dark or blackish, the top of the head is dark brown;

the whiskers and long hairs growing over the eyes are black. The throat, legs, and all the under parts of the body are of a dark chestnut-colour. The hair on the tail is dusky throughout, longer than on the back and darker at the end. The toes are covered with short hairs, which are black. The inner toes on the hind feet and the outer on the fore feet, are shorter than the others; there is a rudimental fifth toe on the inside of the fore feet. All the toes are provided with long and sharp claws, those on the fore feet being longest and most arched.

Species III.—*Franklin's Marmot.*

Arctomys Franklinii; Sab.

Arctomys Franklinii; Gray American Marmot, Sabine, Trans. Linn. Society, xiii. 587, App. to Franklin, p. 662.

This interesting animal was found near Fort Enterprize, by the expedition under command of the intrepid and adventurous Capt. Franklin, in honour of whom the scientific designation was bestowed by Sabine, whose own name is invariably associated by scientific readers with profound and philosophical research, illumined and adorned by a mind richly imbued with the most valuable learning. As the trivial name, *Gray American Marmot*, is equally applicable to other species, we have preferred to translate the scientific appellation, which more definitely refers to the species in question.

In size this animal equals a large rat, measuring eleven inches from the nose to the insertion of the

tail; the latter, to the end of the hair at its extremity, is five inches long. Its face is broad and nearly covered with rigid black and white hairs, which give it a gray colour; the nose is very blunt, and the ears are broad and covered with short hairs. The whiskers on the cheeks are short and black, and similar hairs thinly distributed grow above and below the eyes.* The upper part of the body is covered with short hairs, dark at the base, dingy white in the middle, then first black, next yellowish white, and tipped with black, the whole forming a variegated dark yellowish gray. On the sides the hair is longer, not so black, and destitute of the yellow tinge; on the belly it is dark at the base, and dingy white at tip. The tail is covered with long hairs, banded with black and white, and tipped with white, the whole appearing indistinctly striped with black and white. The feet are rather broad, the toes being thin and covered with gray hairs. On the fore feet the second toe from the inside is longest; the outer shortest and placed far back; the three centre hind toes nearly of an equal length, the extremes shorter and far back. The claws, which are of a horn-colour, are long and sharp on the fore feet, and on the hind feet shorter.†

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* The upper fore teeth are short and reddish yellow; the lower fore teeth are twice the length of the upper, and paler.

† See Sabine's paper as above quoted.

Species IV.—*Tawny American Marmot.*

Arctomys Richardsonii; Sab.

Arctomys Richardsonii: Sabine, Linn. Soc. Trans. xiii. 589.

This marmot was found by Franklin's expedition, near Carlton-house, in the Hudson's Bay country, and was named in honour of Dr. John Richardson, who, on that perilous journey, was so highly distinguished for his scientific zeal, and his intrepid and philanthropic spirit.

The tawny American marmot, or Richardson's marmot, is nearly of the size of the foregoing species, but more slender. The top of the head is covered with short hairs, dark at the base and light at their tips. The nose is tapering, sharp, bare at the end, and covered above with short light brown hairs, joining and mixing with those on the top of the head. The ears are short and oval; the cheeks swollen and clothed with light brown hairs; the whiskers are short, growing from the cheeks, and there are a few rigid hairs above the eyes. The throat is of a dirty white colour; the upper part of the body is covered with short soft hairs, dark at the base and fulvous at their extremities; in the middle of the back the hairs are like those on the top of the head, but lighter. The hair on the sides is longer, when raised appearing dark at the base, the ends being of a smoky white; the under parts are similar but dashed with a little rust-colour. The tail is three inches and a-half long to the end of the hair, slender and thinly covered with long hairs, which, at the base, are of

the same colour as the body, but above of three distinct hues,—first black, next dark, and lastly light at the upper extremity. The legs are rather long and slender, with narrow feet, furnished with sharp, arched, horn-coloured claws. The fore feet have on the inside a small toe placed far back, with a blunt claw, which gives it a character different from the general character of the genus. The outer toe and claw of the fore feet much shorter than the remaining three, the middle one of which is the longest. Of the hind toes the two extremes shorter and placed back, the other three of nearly the same length.*

Species V.—*Hood's Marmot.*

Arctomys Tridecemlineatus; Mitchill.

Sciurus Tridecemlineatus; Federation Squirrel: Mitchill, Med. Rep. 1821.
Ecureuil de la Federation: Desm. Mammal. p. 339.
Arctomys Hoodii: Sab. Trans. Linn. Society, xiii. 590.

This beautiful marmot is an inhabitant of the northern and western parts of this country, and when first discovered was thought to be a squirrel, and classed near the *sciurus striatus*, or ground-squirrel, to which it exhibits considerable analogy in the arrangement of its stripes. Though now properly removed to the genus Arctomys, we retain the *specific* name first proposed by our distinguished countryman Professor Mitchill, derived from the number of stripes on the back of the animal, being the same as

* Sabine as above quoted.

that displayed in the "star spangled banner" of our federation.* For the trivial name we have adopted a translation of the scientific appellation proposed by SABINE, in honour of Lieut. HOOD, so truly meritorious for his exertions on the expedition commanded by Franklin, and remarkable for having been so cruelly murdered by one of his fellow travellers.

From the nose to the root of the tail Hood's marmot is about seven inches and a-half long, and the tail itself two inches. The top of the head is broad, flat, and obscurely marked with alternate stripes of dark brown and dingy white. The nose is tapering and very sharp, being covered with light brown hairs. The ears are small and very short, the cheeks tumid and clothed with dingy light, coloured hairs, the throat being of the same colour; the whiskers are rather long and grow from between the nose and the eyes; some small rigid hairs, similar to the whiskers, also grow over the eyes. The whole of the upper part of the body is marked on each side longitudinally with three alternate dark brown and dingy white stripes, the dark being twice as broad as the light, and dotted in the centre, at equal distances throughout their whole length, with small spots of dingy white. In the centre of the back there is a dark stripe, rather broader than the others. The lowest stripe on each side is not so well marked or distinctly spotted. All the under parts are of a dingy white or slightly tawny colour. The tail is

* To the kindness of Dr. J. E. DEKAY of New-York, we are indebted for an opportunity of examining a fine specimen of this marmot.

indistinctly banded with dark brown and dingy white, being of the latter colour at tip.

The fore legs, which are short and small, are covered with light hairs; the outer toe and claw are small and placed back, the centre toe is the longest of the other three. On the inside there is also a rudimental toe with a small obtuse claw, but this is not so remarkable as in the tawny marmot. The hind legs are longer than the fore legs, and clothed with light hairs; the extreme toes and claws are nearly of equal length and placed far back; the three others are also of equal length with each other. The claws are dark horn-colour, small and light at their ends, the fore ones being the longest.*

Species VI.—*The Prairie Marmot.*

Arctomys Ludovicianus: Ord.

Petit chien: Lewis & Clarke, i. 67.
Wistonwish: Pike, Exped. &c. 156.
Arctomys Ludovicianus: Ord. in Guthrie, ii. 302. [1815.]
Arctomys Missouriensis: Warden, Descr. des Etats Unis. v. 567.
Arctomys Ludovicianus: Say, Long's Exped. to the Rocky Mountains, i. 451.

[*Le Petit chien des Voyageurs; commonly called Prairie-dog.*]

The vast solitudes of our remote territories, where man has not yet established his abode, are generally overshadowed by dense forests, which, during an unknown lapse of ages, have there successively flour-

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* See Sabine, as above quoted.

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1 Hoods Marmot. 2 Louisiana Marmot.

ished and decayed; imparting to the landscape a character of grand though sombre uniformity, broken only by the courses of rivers, the ruggedness and sterility of some portions of soil, or where the furious hurricane has swept along, prostrating the giant sons of earth with a destructiveness proportioned to their resistance. The traveller who, impelled by curiosity, advances beyond the "father of western rivers," with delighted admiration finds himself gradually emerging from these apparently interminable shades, and entering upon a new world. Before him, spreading as far as vision can extend, he beholds fields of richest verdure, interspersed with clumps of slight and graceful trees, as if with an exclusive view to ornament, and discovers the far distant windings of the river as it steals through the plain, by the cottonwood and willows fringing its banks. After traversing such scenes, enlivened by numerous herds of browsing animals, that here find a luxurious subsistence, and arriving at the higher and more barren parts of the tract, he is startled by a sudden shrill whistle, which he may fear to be the signal of some ambushed savage; but on advancing into a clearer space, the innocent cause of alarm is found to be a little quadruped whose dwelling is indicated by a small mound of earth, near which the animal sits erect in an attitude of profound attention. Similar mounds are now seen to be scattered at intervals over many acres of ground, and the whole forms one village or community, containing thousands of inhabitants, whose various actions and gambols awaken the most pleasing associations.

In some instances these villages are limited, or at most occupy but a few acres, but still nearer to the Rocky Mountains, where they are entirely undisturbed, they are found to extend even for miles. We may form some idea of the number of these animals when we learn that each burrow contains several occupants, and that frequently as many as seven or eight are seen reposing upon one mound. Here in pleasant weather they delight to sport, and enjoy the warmth of the sun. On the approach of danger, while it is yet too distant to be feared, they bark defiance, and flourish their little tails with great intrepidity. But as soon as it appears to be drawing rather nigh, the whole troop precipitately retire into their subterranean cells, where they securely remain until the peril be past. One by one they then peep forth, and vigilantly scrutinize every sound and object before they resume their wonted actions. While thus near to their retreats they almost uniformly escape the hunter, and if killed they mostly fall into their burrows, which are too deep to allow their bodies to be obtained.

The villages found nearest the mountains, have an appearance of greater antiquity than those observed elsewhere. Some of the mounds in such situations are several yards in diameter, though of slight elevation. These, except about the entrance, are overgrown by a scanty herbage, which is characteristic of the vicinity of these villages. Say has observed on this subject, that it is not easy to assign a reason for the preference shown by the prairie marmot, which lives on grassy and herbaceous plants,

in selecting the most barren places for its dwelling, "unless it be that he may enjoy an unobstructed view of the surrounding country, in order to be seasonably warned of the approach of wolves or other enemies." This reason may be sufficiently valid of itself, but we would suggest another in the difference of soil, rendering such barren places fitter for the burrows. It is by no means necessary to suppose that this marmot obtains its food exclusively near its own dwelling. We know that this is not the case with the Maryland marmot, which so closely resembles this species in every respect, and goes to considerable distances in search of food, even in the immediate vicinity of man.*

The mound thrown up by the prairie marmot consists of the earth excavated in forming the burrow, and rarely rises higher than eighteen inches, though measuring two or three feet in width at the base. The form of the mound is that of a truncated cone, and the entrance, which is a comparatively large hole, is at the summit or in the side, the whole surface, but especially the top of the mound, being well beaten down like a much used foot-path. From the entrance the hole descends perpendicularly for a foot or two, and then is continued obliquely or somewhat spirally downwards, to a depth which has not been determined.

This marmot, like his kindred species, passes the winter in a state of torpidity, and to secure himself comfortably against the effects of the cold, he closes

* PIKE says of the prairie marmot, that "they never extend their excursions more than half a mile from their burrows."

accurately the mouth of the burrow, and constructs at the bottom of it a neat globular cell, of fine dry grass, having an aperture at top sufficiently large to admit a finger, and so compactly put together that it might almost be rolled along the ground uninjured.

This active and industrious community of quadrupeds (like every other society,) is infested by various depredators who subsist by plunder, or are too ignorant or indolent to labour for themselves. Hence a strange association is frequently observed in their villages, for burrowing-owls (*Stryx Hypugea* of Bonaparte,*) rattle-snakes, lizards and land-tortoises, are seen to take refuge in their habitations. The burrowing-owl, however, appears to appropriate an excavation to his own use, as is evinced by its decayed and dilapidated condition, while those frequented by the marmot are always neat and in good repair. The young of the marmot most probably become the prey of this singular bird. The rattle-snakes also exact their tribute with great certainty, and without exciting alarm, as they can penetrate the inmost recesses of the burrow, and a slight wound inflicted by their fangs is followed by the immediate extinction of life.†

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* See his splendid work on American Ornithology, vol. i.

† "It is extremely dangerous to pass through their towns, as they abound with rattle-snakes, both of the yellow and black species; and strange as it may appear, I have seen the *wiston-wish* (prairie marmot,) the horn-frog (orbicular lizard,) and a land-tortoise all take refuge in the same hole. I do not pretend to assert that it was their common place of resort, but I have witnessed the above facts in more than one instance."—*Pike*, p. 156.

The prairie marmot is about sixteen inches long from the tip of the nose to the root of the tail, which is two inches and three-quarters in length. The head is broad and depressed above with large eyes, having dark brown irides. The ears are short and truncated; the whiskers black and of moderate length; there are a few bristles above the eye, and a few also on the side of the cheek; the nose is rather short and compressed. The general colour is a light dingy reddish brown, intermingled with some gray, and a few black hairs, which are dark or dusky at base, then bluish white, then light reddish, and finally gray at tip. The under parts of the body are of a dirty white colour; the hair on the anterior legs, that on the throat and on the neck, is not dusky at base.*

All the feet are five-toed, clothed with very short hair, and armed with rather long black nails; the outer one on the fore feet reaches nearly to the base of the next, and the middle one is nearly half an inch long. The thumb has a conical nail, three-tenths of an inch in length; the tail is banded with brown near the tip, and the hair, except that next the body, is not plumbeous at base.

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* The description of this species is from Say, who has given the best account of the habits of this animal hitherto published.

Species VII.—*Parry's Marmot.*

Arctomys Parryii; Richardson.

Arctomys Parryii, Gray Arctic Marmot: Richardson, App. to Franklin.
Arctomys Alpina: Parry's 2d Voyage, p. 61.

This species was brought in by the expedition under Capt. Franklin, and was named by Dr. Richardson in honour of Capt. Parry. It is rather larger than the Arctomys Franklinii, and measures to the root of the tail twelve or fourteen inches; the tail itself is four inches long, and the hair at its extremity five inches and a-half in length.

Parry's marmot has a broad and flattened body, with thick legs; flattish head and blunt nose, covered with a close coat of short brown hairs. The margin of the mouth is hoary; the eyes are large and black coloured. The ear is very short, consisting of a flat semi-oval cartilage, projecting about the sixth of an inch over a large auditory passage. The cheek-pouches, which are very large, open into the mouth anterior to the grinders.

The body is covered with a soft fur, consisting of a soft down of a dark smoky gray at the roots, pale clear gray in the middle, and yellowish gray at the tip. This arrangement causes a crowded assemblage of ill defined, irregular, and confluent whitish spots, margined and separated by black. The throat and all the under parts of the body are brownish red and brownish yellow, or rather an intermediate colour, blending with the colours of the back. The tail is flattish and subdistichous, and is at the will of the

animal expanded like a feather; it is then brown along the middle, tipped and margined for two-thirds of its length with black. The feet are furnished with five toes, having short flattened claws, which are large, blackish, slightly arched and grooved underneath. On the inside of the fore feet, and high up, there is a small toe or thumb, armed with a small nail; the palms are naked and have callous protuberances, three of them at the base of the toes, from the largest of which the thumb rises.*

* Richardson, as cited above.

CHAPTER X.

Genus XXVIII.—Squirrel; *Sciurus;* L.

Gr. Σκιουρος. *Germ.* Eichorn.
Fr. Ecureuil. *Ital.* Scojattolo.

GENERIC CHARACTERS.

The head is somewhat elongated, with a sharp muzzle, moderately long ears, and large eyes. The upper lip is divided, and the cheeks destitute of pouches, the neck of a middling length, and the body rather slender. The teats are eight in number, two being situated on the chest and six on the belly. The posterior are much longer than the anterior extremities, which have four digits and a rudimental thumb; the external digit is short, the others are long. The posterior feet are five-toed, with a short internal and external digit: the three intermediate toes are long and slender. The next to the external toe is the longest of all, both in the anterior and posterior feet, the digits of which are furnished with curved acute nails, with the exception of the rudimental thumb, which is blunt and naked. The tail is long and clothed with long and thickly set hairs.

*Dental System.**

22 Teeth:
- 12 Upper: 2 Incisive, 10 Molar.
- 10 Lower: 2 Incisive, 8 Molar.

In the upper jaw the incisive is smooth and rounded in front, and rises from the sides of the anterior part of the maxillary bone. The first molar is a rudimental and cylindrical tooth, which falls out very early, and which is placed against the antero-internal surface of the second; this latter, which is sometimes a little smaller than the following, has, like them, a central depression, and another smaller one at both extremities: from these three depressions results a small spine on the anterior edge of the tooth, then two prominences, separated from each other by the central depression, and, finally, another small crest or spine on its posterior edge.

On the outside of these depressions prominences and spines remain distinct, but on the inside they are reunited by a large and circular crest. This crest embraces the second molar rather less than the others, which thus differs in being narrower internally than externally: the same is the case with the last, which differs by the prolongation of its postero-external part.

* Frederic Cuvier introduces this dental system by remarking that it is evidently similar to that of the marmot and spermophili, all forming one and the same family; they differ, however, in some circumstances, which are uniform in their recurrence, and by consequence are characteristic.

In the lower jaw the incisor is like that of the upper jaw, but is narrower, and rises from below and behind the last molar. The third molar is a third smaller than the others, which gradually increase in size to the last, but all formed alike, presenting in their middle a circular depression, and on their periphery a crest divided by a groove at the internal and at the external edge: from the centre of each of these grooves a small tubercle arises. Age, however, soon effaces these fugitive characters, and then these teeth exhibit a nearly smooth surface.

The species comprised in this genus are in different degrees remarkable for their sprightly agility and graceful movements, as well as for their personal beauty and neatness. The forest is their appropriate residence, and nature has provided them not only with the means of rapidly ascending the loftiest trees, but with teeth capable of opening the way to food, which is effectually secured from almost every other creature. The hardest nuts found in the woods afford ample provision to the squirrels, and the number of nuts destroyed by these animals, though small when compared with the whole quantity produced, must have some effect in preventing the superabundant increase of forest trees.

The muscular strength displayed by these animals is very great, when compared with their size. They make astonishing leaps from branch to branch, and from tree to tree, when engaged in sporting with each other, or endeavouring to escape from pursuit. At such times, when no tree is sufficiently near to

be reached by a single spring, the squirrel unhesitatingly drops from the greatest height to the ground, and falls with a force apparently sufficient to crush him; but no injury is experienced, and a few seconds are sufficient for his escape into the top of the nearest tree.

The actions of most of these animals are marked by a peculiar vivacity and playfulness. When moving on the ground, squirrels advance by a succession of short leaps, while the long bushy tail, waving in graceful undulations, renders their whole appearance very interesting. When engaged in listening, they sit erect on their hinder limbs, having the tail beautifully raised against the back, and falling in an easy curve at its extremity towards the ground. In eating, the position is much the same; the food is held in the fore paws, principally between the rudimental thumbs and the adjoining part of the palms. The facility with which they cut through the covering of the hardest nuts is very remarkable; they first turn the nut about until they get it into the most favourable position, and then examine it by gnawing slightly in different places. If the nut be withered or rotten it is speedily thrown aside and another sought. When a good one is obtained, and the proper place for opening it is selected, (which is the thinnest part, immediately over the kernel,) a small linear opening is first made, which at length admits the points of the lower front teeth. These are now inserted, and the hole enlarged by breaking off successive pieces of the shell in the direction of the kernel. A hickory-nut is thus frequently cut down on four sides from end to end,

leaving the intermediate thick portions untouched. After satisfying his hunger the squirrel generally buries the superfluous food; previous to the approach of winter large hoards of nuts and grain are collected and secured in the ground for future use. Their nests are at no great distance from these store-houses, and are built of small sticks and leaves in the top branches of forest trees, or in hollows of their trunks, except in the case of a few species which inhabit burrows at all times. All the squirrels are peculiarly cleanly, and are frequently seen to rub their heads and faces with their fore paws as if for the purpose of washing. When they accidentally step into water they make use of their bushy tail for the purpose of drying themselves, passing it several times through their hands.

Like most of the animals belonging to this order, they are very prolific, and multiply until from their numbers large districts of country are injuriously overrun by them. They then invade and literally lay waste the cornfields, consuming vast quantities of grain, and destroy nearly as much as they eat by breaking it down and scattering it on the ground. On such occasions the farmers in thinly settled districts severely suffer, and are deprived of a large share of the fruits of their industry. The efforts of a whole family are occasionally insufficient to drive off or destroy these busy plunderers, as new crowds appear to be continually arriving to renew the depredation.

While travelling through the state of Ohio, in the autumn of 1832, we had an opportunity of witnessing something of this sort. Parts of the country

appeared to swarm with squirrels, which were so numerous that, in travelling along the high road, they might be seen scampering in every direction; the woods and fields might be truly said, in the country phrase, to be "alive with them." A farmer, who had a large field of Indian corn near the road, informed us, that notwithstanding the continued exertions of himself and his two sons, he feared he should lose the greater part of his crop, in addition to his time and the expense of ammunition used in killing and scaring off the little robbers. This man and his sons frequently took stations in different parts of the field, and killed squirrels until their guns became too dirty longer to be used with safety; yet they always found, on returning, that the squirrels had mustered as strongly as before. During this journey we frequently met squirrel-shooters heavily laden with this game, which in many instances they had only desisted from slaying from want of ammunition or through mere fatigue.

Fortunately for the farmers these animals are not at the same time equally numerous in different parts of the country. We found the squirrels in 1822, most numerous throughout the country lying between the Great and Little Miami rivers; they became evidently fewer as we advanced towards Chillicothe, and beyond that place were so rare as to be seldom seen. During some seasons they appear to move in mass, deserting certain districts entirely, and concentrating upon others. In such migrations vast numbers are drowned in crossing the rivers, and numbers are also destroyed by beasts and birds of prey, and various other causes.

Species 1.—*The Fox Squirrel.*

Sciurus Vulpinus: Gmel.

Sciurus Vulpinus: Gmel. Turton's L. i. 91.
The Fox Squirrel: Lawson's Carolina, 124.

This fine squirrel is found throughout the southern states, where it frequents the pine forests in considerable numbers, and derives its principle subsistence from the seeds of the pine. In the tops of these lofty trees it is almost out of the reach of danger, except from the pine-marten or other climbing beasts of prey, and possibly some large predacious birds. The fox squirrel displays a consciousness of his security by the fearless manner in which he usually looks down upon those who pass under the tree on which he is placed. When alarmed, like many of his kindred species, he immediately resorts to the artifice of spreading himself out, or lying flat on the upper surface of a branch on the side opposite to the apprehended danger, where he patiently clings until he has no longer cause to fear. Under such circumstances it is very difficult to discover his position, or to distinguish him from the branch on which he lies.

The nest of this species is placed in the top of the high pine trees, and is made of twigs and small sticks, lined with leaves, or the long soft moss which is found so commonly streaming from the branches. The season of their sexual intercourse is the month of January. The young, which are from five to seven in number, are seen abroad as early as the month of March.

The fox squirrel measures about fourteen inches, and the tail is sixteen inches in length. The colour varies from white to pale gray and black; various shades of red, mottled, (like the cats called "tortoise shell,") and in short, of all the intermediate hues. This is fully shown in the Philadelphia Museum, where nearly all the varieties just mentioned may be seen. It is therefore not surprising that those who deem colour a sufficient indication of specific difference, should make a number of species of this one. Perhaps many, at present considered well established, will be found to rest on no better foundation, and require to be stricken out of the catalogue.*

Species II.—*The Cat-Squirrel.*

Sciurus Cinereus: L. Gmel.

Cat-Squirrel, β Penn. Arct. Zool. i. 137.
Sciurus Capistratus: Bosc. An. du Mus. i. p. 205.
Ecureuil à Masque: C. Régne Anim. i. 205.
Ecureuil Capistrate: Desm. Mammal. p. 332, Sp. 529.

The cat-squirrel is one of our largest species, and is found in great abundance throughout the oak and chestnut forests of this country. It is generally

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* We have much pleasure in acknowledging the receipt of a letter on the subject of the squirrels of this country, from Capt. J. Le Conte, U. S. A. The time, we hope, will soon arrive, when this accomplished naturalist will find leisure to give the scientific world the full benefit of his valuable researches relative to American Natural History.

about eleven inches long, having a tail fourteen inches in length.

This squirrel is comparatively heavy and slow in its movements, running up the trunks of trees and among the branches with more apparent effort than any of the other species; its appearance also is by no means as pleasing as that of any of its kindred. It is rarely seen to leap from tree to tree, or even from branch to branch, except when closely pursued or much alarmed. In building its nest, and in general habits, it is very similar to the other species. The size is the only circumstance which distinguishes it positively from the fox-squirrel.

As to colour, it is impossible to state all the shades and variegations exhibited by this species. In the Philadelphia Museum a great variety may be seen, of almost every colour, from a light gray to black and spotted, pale reddish brown and nearly white. Three individuals, taken from the same nest, are so differently coloured as to be entirely unlike, one having all the marks attributed to the *capistratus*, and the others strongly resembling the common black squirrel.

Species III.—*The Common Gray Squirrel.*

Sciurus Carolinensis; Gmel.

Sciurus Carolinensis et Cinereus: Gm. Schreb. tab. 213.
Petit Gris: Buff. 10, pl. 25, Encycl. pl. 74, fig. 3.
Ecureuil gris de la Carolina; Bosc. ii. p. 96, pl. 29. F. Cuv. Mam. Lithog. livr. 11e.
Gray Squirrel: Penn. Arct. Zool. i. 135, Hist. Quad. No. 272.

This species, still exceedingly common throughout the United States, was once so excessively multiplied as to be a scourge to the inhabitants, not only consuming their grain, but exhausting the public treasury by the amount of premiums given for their destruction. "Pennsylvania (says Pennant,) paid from January, 1749, to January, 1750, *eight thousand pounds* currency; but on complaint being made by the deputies that their treasuries were exhausted by these rewards, they were reduced to one half;—[from three pence to a penny and a half.] How improved must the state of the Americans then be, in thirty-five years to wage an expensive and successful war against its parent country, which before could not bear the charges of clearing the provinces from the ravages of these insignificant animals!"

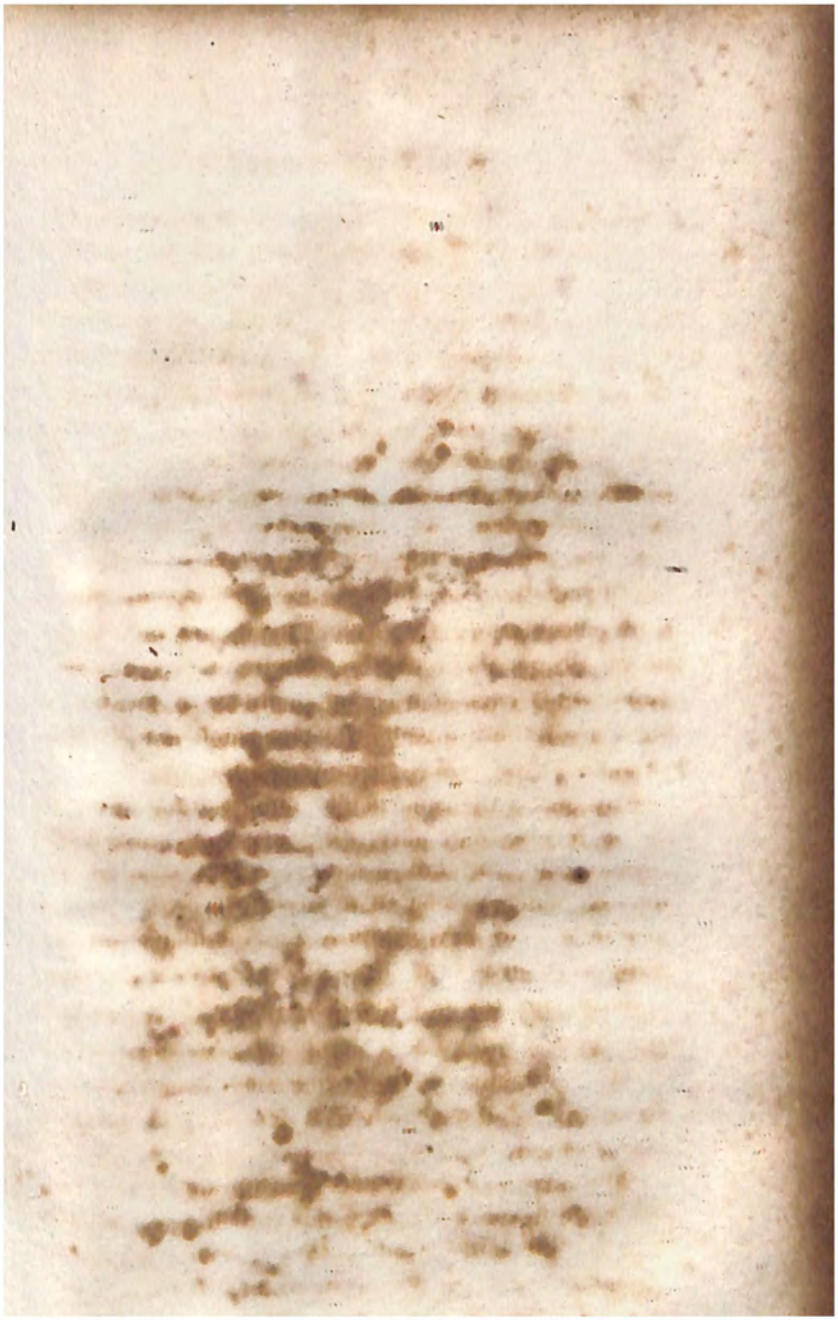
The gray squirrel prefers the oak, hickory and chestnut woods, where it finds a copious supply of nuts and mast, of which it provides large hoards for the winter. Their nests are placed chiefly in tall oak-trees at the forks of the branches; these nests are very comfortable, being thickly covered and lined with dried leaves. During cold weather the squirrels seldom leave these snug retreats, except for the purpose of visiting their store-houses, and obtaining

a supply of provisions. It has been observed that the approach of uncommonly cold weather is foretold when these squirrels are seen out in unusual numbers, gathering a larger stock of provisions, lest their magazines should fail. This, however, is not an infallible sign, at least in vicinities where many hogs are allowed to roam at large, as these keen-nosed brutes are very expert at discovering the winter hoards of the squirrel, which they immediately appropriate to their own use.

If the gray squirrels confined themselves to the diet afforded by the forest trees, the farmers would profit considerably thereby. But, having once tasted the sweetness of Indian corn and other cultivated grains, they leave acorns and such coarse fare to the hogs, while they invade the corn-fields, and carry off and destroy a very large quantity.

This species is remarkable among all our squirrels for its beauty and activity. It is in captivity remarkably playful and mischievous, and is more frequently kept as a pet than any other. It becomes very tame, and may be allowed to spend a great deal of the time entirely at liberty, where there is nothing exposed that can be injured by its teeth, which it is sure to try upon every article of furniture, &c. in its vicinity. This squirrel, when domesticated, drinks frequently, and a considerable quantity of water at each draught.

The gray squirrel varies considerably in colour, but is most commonly of a fine bluish gray, mingled with a slight golden hue. This golden colour is especially obvious on the head, along the sides, where the white hair of the belly approaches the gray of



1 *Chickaree S.* 2 *Grey S.* 3 *Black S.*

the sides, and on the anterior part of the fore and superior part of the hind feet, where it is very rich and deep. This mark on the hind feet is very permanent, and evident even in those varieties which differ most from the common colour. There is one specimen in the Philadelphia Museum of a light brownish red on all the superior parts of the body.

Species IV.—*The Black Squirrel.*

Sciurus Niger; L.

Black Squirrel: Penn. Arct. Zool. i. 138. Hist. Quad. No. 273. Brown's Zool. tab. xvii.
Sciurus Mexicanus: Herman. 382.
Black Squirrel: Catesby's Carolina, ii. p. 73.

This species is very common, but is liable to be confounded with the black varieties of the squirrels heretofore described. From the black varieties of the cat-squirrel, *S. Cinereus*, it may be easily distinguished by its smaller size and the softness of its fur. The proportional length of the tail, together with the difference in number of the jaw teeth, will distinguish it from the fox-squirrel, *S. Vulpinus*, which has five above and four below, while the black squirrel has four above and four below.

The black squirrel very seldom varies; in the summer the pelage is rather gray on the back and sides, though the whole colour of the body is a black, intermingled with a small quantity of gray, and of a dark reddish brown on the under parts. In the win-

ter the colour is a pure black, varying slightly in intensity on any part of the body.

Species V.—*The Great Tailed Squirrel.*

Sciurus Macroureus; Say.

*Sciurus Macrourus:** Say. Long's Exp. to the Rocky Mountains, i. 115.

This species, which is a fine one, is the most common on the Missouri, where it was first observed by Say, who describes it as displaying all the graceful activity so much admired in the common gray squirrel.

The total length of this species from the tip of the nose to the end of the tail (exclusive of the hair) is nineteen inches and three-quarters, of which the tail makes nine inches and one-tenth. The following description of its colouring, &c. is drawn up from that given by Say, in the work above quoted:

The body above and on each side is of a mixed gray and black; the fur is plumbeous, black at base, then pale cinnamon colour, then black, and finally cinereous, with a long black tip. The ears, three-

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* As the term Macrourus was previously given to the Ceylon squirrel, (see Pennant's History of Quadrupeds, ii. p. 140, No. 330,) we have taken the liberty to change the name given to the present species, by the addition of a single letter, which is sufficient to render further change unnecessary.

fourths of an inch long, are behind of a bright ferruginous colour, extending to the base of the fur, which, in the winter dress, is prominent beyond the edge; on the inside of the ear the fur is of a dull ferruginous hue, slightly tipped with black. The sides of the head and orbits of the eyes are pale ferruginous; beneath the ears and eyes the cheeks are dusky. The whiskers are composed of about five series of rather flattened hairs, the inferior ones are more distinct. The mouth is margined with black; the teeth are of a reddish yellow colour. The under part of the head and neck, and the upper part of the feet, are ferruginous; the belly is paler, the fur being plumbeous at base. The tail is of a bright ferruginous colour below, and this colour extends to the base of the fur with a submarginal black line. On its upper part it is ferruginous and black. The fur within is of a pale cinnamon colour, with the base and three bands black; the tip is ferruginous. The palms of the fore feet are black, and the rudimental thumb, which is very short, is covered by a broad flat nail.

"The fur of the back in the summer dress is from three-fifths to seven-tenths of an inch long; but in the winter dress the longest hairs of the middle of the back are from one inch to one and three-fourths in length. This difference in the length of the hairs, combined with a greater portion of fat, gives to the animal a thicker and shorter appearance; but the colours continue the same, and it is only in this latter season that the ears are fringed, which is the necessary consequence of the elongation of the hair. The species was not an unfrequent article of food at

our frugal yet social meals, at Engineer cantonment, and we could always immediately distinguish the bones from those of other animals by their remarkably red colour. The tail is even more voluminous than that of the *S. Cinereus;*" (cat-squirrel.)

Species VI.—*The Line-Tail Squirrel.*

Sciurus Grammurus; Say.

This species is most remarkable for the peculiar coarseness and flattened form of its fur, and by three black lines on each side of the tail, which are united over the surface of it, as in the Barbary squirrel, *S. Getulus.*

The Line-Tail squirrel inhabits the Missouri country, about the naked parts of the sand-stone cliffs, where there are but few bushes. Its nest is found in holes and crevices of rocks, and it appears not to be in the habit of ascending trees, unless driven. It feeds on the buds, leaves, and fruits of the plants growing in the situations we have mentioned.

The line-tail squirrel measures eleven inches and a-half, and its tail is nine inches long. The general colour of the body is cinereous, variously tinged with rust-colour. The fur is very coarse, much flattened, canaliculate above; it is lead coloured or blackish at base, then whitish or ferruginous, with a brownish tip. The whitish colour prevails above the neck and shoulders, while the ferruginous is in greatest quantity from the middle of the back, sides, and exterior surface of the legs; above and be-

low the orbits of the eyes the fur is whitish, the tail is whitish, being marked by three black lines, the base and tip of each hair being whitish, beneath, the colour is whitish, tinged with ferruginous.

Species VII.—*The Four-Lined Squirrel.*

Sciurus Quadrivittatus; Say.

Sciurus Quadrivittatus: Say. Long's Ex. to the Rocky Mountains, ii. 45.

This handsome little squirrel is found on the Rocky Mountains adjacent to the sources of the rivers Arkansa and Platte. Of its habits we know nothing but what is given in the following sentences, by Say, in the work above quoted:

"It does not seem to ascend trees by choice, but nestles in holes and on the edge of the rocks. We did not observe it to have cheek-pouches. Its nest is composed of a most extraordinary quantity of the burrs of the xanthium, branches and other portions of the large upright cactus, small branches of pine trees, and other vegetable productions, sufficient in some instances to fill an ordinary cart. What the object of so great, and apparently so superfluous, an assemblage of rubbish may be, we are at a loss to conjecture, we do not know what peculiarly dangerous enemy it may be intended to exclude by so much labour. Their principal food, at least at this season, is the seeds of the pine, which they readily extract from the cones."

The four-lined squirrel is four inches and a quarter long, from the tip of the nose to the root of the

tail; the tail is three inches in length. The head is of a brown colour, mixed with tawny, having four white lines; the upper one on each side passes from the tip of the nose immediately over the eye to the superior base of the ear, and the lower one passes immediately beneath the eye to the inferior base of the ear. The ears are of a moderate size and half oval. On the back there are four broad white lines, and alternate, mixed black and ferruginous ones. The sides are tawny; the under part of the body whitish. The hair of the tail is black at base, then tawny, then black in the middle, and paler tawny at tip. Beneath it is fulvous, having a submarginal black line. On the anterior feet there is a prominent tubercle in place of a thumb. The striped head, less rounded ears, and bushy tail, which is neither banded nor striated, together with its smaller size and the presence of the thumb warts, in SAY'S opinion, sufficiently distinguish this species from the *S. Getulus*, or Barbary squirrel of Linné.

SPECIES VIII.—*The Hudson's Bay Squirrel.*

Sciurus Hudsonius: FOSTER. Royal Soc. Trans. lxii. 378.
Hudson Squirrel: PENN. Arct. Zool. i. 134. No. 48. Hist. Quad. No. 274.
Sciurus Hudsonius: GMEL. SCHREB. tab. 214.
The Common Squirrel: HEARNE, 8vo. ed. 378.

[*Commonly called Chickaree.*]

This beautiful species is very common in the northern and western parts of this country, and, where seldom disturbed, are so fearless as to allow themselves to be approached almost within reach.

They resemble the European more closely than any of our squirrels, and are remarkable for having tufts on the ears like that species, *S. Vulgaris*. This arrangement of the hair on the ears has been hitherto regarded as peculiar to European squirrels, and Pennant, in his Arctic Zoology, has prefixed to his description of the Hudson's Bay squirrel the following: "N. B. The ears of the *American* squirrels have no tufts," which is rather unfortunately placed before an *American species*, possessing these appendages in a very conspicuous degree.*

The Hudson's Bay squirrel is, perhaps, more remarkable for its neatness and beauty than any of its kindred species, which, in habits and manners, it closely resembles. It is between seven and eight inches long, having a tail five inches in length. Its whiskers are very long and black; the superior parts of the body are of a reddish brown colour, varying in intensity, and shaded with black. On the inferior parts the general colour is a tarnished or yellowish white.—The under part of the head and front of the fore limbs are reddish brown, like the back; the insides of the thighs are coloured like the belly; on each flank there is a distinctly marked black line, separating the colours of the back and belly. The tail is of a reddish brown colour, and is very beautiful.

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* Other American species of squirrels have tufts on their ears, when in full pelage; none, however, so remarkably as the Hudson's Bay squirrel. Next to this species, Say's great tailed squirrel *(S. Macroureus,)* has them longest.

"The common squirrels are plentiful in the woody parts of this (the Hudson's Bay) country, and are caught by the natives in considerable numbers with snares, while the boys kill many of them with blunt-headed arrows. The method of snaring them is rather curious, though very simple, as it consists of nothing more than setting a number of snares all around the body of the tree in which they are seen, and arranging them in such a manner that it is scarcely possible for the squirrels to descend without being entangled in one of them. This is generally the amusement of the boys. Though small, and seldom fat, yet they are good eating.

"The beauty and delicacy of this animal induced me to attempt taming and domesticating some of them, but without success; for though several of them were so familiar as to take any thing out of my hand, and sit on the table where I was writing, and play with the pens, &c. yet they never would bear to be handled, and were very mischievous, gnawing the chair bottoms, window-curtains and sashes to pieces. They are an article of trade in the company's standard, but the greatest part of their skins, being killed in summer, are of very little value."*

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* Hearne, as above cited.

Species IX.—*The Red-Belly Squirrel.*

Sciurus Rufiventer; Geoff.

Sciurus Rufiventer: Geoff. Coll du Mus. Desm. Nouv. Dict. d'Hist. Nat. ton. x. 103.

An individual of this species, brought from the vicinity of New Orleans, belongs to the valuable collection of the Philadelphia Museum. It is about seven or eight inches long, having the tail shorter than the body. Its general colour is dark grayish brown above, with a bright yellowish red beneath. The tail at its base is of the colour of the back, about its middle it is of nearly the same colour as the belly, and at the extremity it is yellowish.*

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* The following is the description of this species, given by Desmarest, p. 333:—The pelage is of a reddish brown, pricked with black on the head, neck, flanks and paws; all the hairs covering these parts being of a gray slate-colour at their bases, then clear brown or yellowish, and deep brown at their tips; the lower jaw, under part of the neck, throat, belly, and inner surface of the paws, of a nearly pure red. The neck is as if marked with transverse brownish lines; whiskers black and as long as the head; ears reddish and covered with short hairs; extremities of the paws of a deep brown, without mixture of yellow; tail bushy, brown at its base and yellow at its extremity.

Species X.—*The Ground Squirrel.**

Sciurus Striatus; Klein.

Sciurus Striatus: Klein. Pall. Glires, 378. Gmel. Schreb. tab. 221.
Sciurus Lysteri: Ray, Lyn. Quad. 216.
Sciurus Carolinensis: Briss. Reg. An. 155, No. 9.
Ecureuil Suisse: Desm. 339, Sp. 547.

[*Commonly called Hacky, or Hackee, Ground, or Striped Squirrel.*]

Few persons have travelled through our delightful country without becoming acquainted with the pretty animal we are now to describe,—which, though very different in its general appearance from its kindred tenanting the lofty forest-trees, still approaches to them so closely in personal beauty and activity, as always to command the attention of the most incidental observer.

This squirrel is most generally seen scudding along the lower rails of the common zigzag or "Virginia" fences, which afford him at once a pleasant and secure path, as in a few turns he finds a safe hiding place behind the projecting angles, or enters his burrow undiscovered. When no fence is near, or his retreat is cut off, after having been out in search of food, he becomes exceedingly alarmed, and runs up the nearest tree, uttering a very shrill cry or whistle, indicative of his distress, and it is in this situation that

* This and the following species belong to the subgenus *Tamias*, of Illiger; having cheek-pouches.

1. *Flying Squirrel.* 2. *Great-tailed S.* 3. *Ground S.*

he is most frequently made captive by his persecuting enemies, the mischievous school-boys.

The ground-squirrel makes his burrow generally near the roots of trees, along the course of fences and old walls, or in banks adjacent to forests, whence he obtains his principal supplies of food. The burrows frequently extend to very considerable distances, having several galleries or lateral excavations, in which provisions are stored for winter use. The burrow has always two openings, which are usually far distant from each other; it very rarely happens that the animal is dug out, unless it be accidentally during the winter season.

The ground-squirrel appears to suffer more when made captive than any other squirrel with which we are acquainted. We have several times endeavoured to tame individuals of this species, but without success. In losing its liberty, the ground-squirrel appears to lose all vivacity, becomes a dull and melancholy animal, and can yield very little amusement or satisfaction to its keeper, whom it always flies, or bites severely, if not permitted to get out of his reach.

The ground-squirrel is rather more than five inches in length, from the nose to the root of the tail; the last is about two inches and a-half long.—The general colour of the head and upper parts of the body is reddish brown, all the hairs on these parts being gray at base. The eye-lids are whitish, and from the external angle of each eye a black line runs towards the ear, while on each cheek there is a reddish brown line. The short rounded ears

are covered with fine hairs, which are on the outside of a reddish brown colour, and within of a whitish gray. The upper part of the neck, shoulders, and base of the hair on the back, are of a gray brown, mingled with whitish.

On the back there are five longitudinal black bands, which are at their posterior parts bordered slightly with red. The middle one begins at the back of the head, the two lateral ones on the shoulders; they all terminate at the rump, whose colour is reddish. On each side two white separate the lateral black bands. The lower part of the flanks and sides of the neck are of a paler red; the exterior of the fore feet is of a grayish yellow; the thighs and hind feet are red above. The upper lip, the chin, throat, belly, and internal face of the limbs, are of a dirty brown. The tail is reddish at its base, blackish below, and has an edging of black.

SPECIES XI.—*The Rocky Mountain Ground-Squirrel.*

Sciurus Lateralis; SAY.

Sciurus Lateralis: SAY, Long's Exped. to the Rocky Mountains, ii. 46.

The Rocky Mountain ground-squirrel was first seen by LEWIS and CLARK, while on their celebrated expedition to the Pacific Ocean; they, however, merely mention it in their journal, without appending a particular description. SAY has given a description of the species, but no account of its habits,

which we may infer to be generally similar to those of the common ground-squirrel, to which this species is nearly allied.

The Rocky Mountain ground-squirrel may be distinguished from the common species by being of rather larger size, entirely destitute of the line along the middle of the back, by the lateral lines commencing anterior to the humerus, where they are broadest, by the longer nails on the fore feet, and the broad nails on the thumb tubercles. It is, however, most closely allied to the *S. Bilineatus* of Geoffroy.

The body is of a brownish ash colour, intermixed with blackish above. On each side of the back there is a dull yellowish-white dilated line, which is broader before, and margined above and beneath with black; these lines commence on the neck, anterior to the fore limbs, and terminate before they reach the tail. There is no vertebral line. The top of the head, neck, anterior to the tip of the white line, and the thigh, are tinged with rust-colour; the orbit is whitish. The sides are of a dull yellowish-white; the colour beneath is pale mixed with blackish. The tail is short and thin, having a submarginal black line beneath. The nails on the fore feet are elongated, and the thumb tubercles are furnished with broad nails.*

* Say: loco citato.

CHAPTER XI.

Genus XXIX.—Flying-Squirrel; *Pteromys;* Ill.

GENERIC CHARACTERS.

The head is short and thick, having small or moderate sized ears, large prominent eyes, a somewhat blunted snout, and the upper lip divided. The trunk of the body is proportionally shorter and thicker than in other squirrels, and the skin of the sides is extended from the fore to the hind limbs, so as to form a sort of sail, which, in most of the species, is spread out by an additional bone on the anterior extremities, articulated with the wrist. The tail is either long, or of moderate length, flattened and distichous.

The *dental system* of this genus is the same as the preceding.

Species I.—*The Common Flying-Squirrel.*

Pteromys Volucella.

Sciurus Volucella: L. Gmel. Pall. Schreb. pl. 222.
Pteromys Volucella: Desm. Mam. 343, Encycl. pl. 77. fig. 4.
Le Polatouche: Buff. x. pl. 21. Shaw, Gen. Zool. ii. pt. 1, p. 155.
Assapanniek: Smith's Virginia, p. 27.
Asapan: Fred. Cuv. Mammal. Lithog. livr. 8.

Nature has endowed this beautiful animal with an instrument to facilitate its passage from place to

place in the easiest and most pleasant manner. Capable of moving on the bodies and limbs of trees, like other squirrels, it does not require an equal degree of muscular strength to leap from tree to tree, or from great elevations to the ground, but launching itself from a lofty bough into the air, and extending its limbs and the intervening membranes, its body is buoyed up as by a parachute, and sails swiftly and obliquely downwards, passing over a very considerable space. To aid in this sailing movement, we find the whole body covered with a short and silky fur, which lies close to the skin, and the hairs on the tail, which partake of the same quality, lie close, and form a flattened and feather-shaped rudder.

During the day-light the flying-squirrel is rarely to be met with abroad, unless it has been disturbed. Occasionally large troops are seen together, and their sailing leaps have been said to present to the inexperienced the appearance of a large number of leaves blown off the trees. Their peculiar construction and habit render them very unfit for living on the ground, and they speedily regain the nearest tree, when at any time they fall short of the object towards which they may have leaped. They always take advantage of the wind, when about to leap to any distance, and then they appear to deserve the name of flying-squirrels, from the ease and velocity of their movements.

This species is very common throughout the United States, and individuals are frequently tamed as pets, but are more admired on account of the softness of their fur and the gentleness of their dispositions, than for any of the frolicsome and amusing actions that

characterize other squirrels. Their nocturnal habits, more than their fondness for warmth, or the persons of their keepers, make them always desirous to hide themselves in the pockets, &c. When confined in a cage with a reel appended, they continue running almost uninterruptedly throughout the night.

The flying-squirrel makes its nest in hollow trees, where it brings forth three or four young at a litter. It is very easy to ascertain whether this squirrel has a nest in any hollow tree, by knocking against the trunk with a stone or stick; as soon as the jarring is felt, the animal comes to the opening and endeavours to escape. In this way the young are very commonly discovered and taken.

The flying-squirrel is quite small, being little more than four inches and a-half long, the tail being three inches and a-half in length.

The general colour is a brownish ash, with rounded, nearly naked ears, and large prominent black eyes. The under parts of the body are white, with a yellowish margin where the colour of the back and belly approach each other.

Drawn by Rider

Engd by G.B. Ellis.

1 Maryland Marmot 2 American Porcupine.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

CHAPTER XII.

SECTION II.—INCLAVICULATA.

The Clavicles incomplete, or entirely wanting.

GENUS XXX.—PORCUPINE: *Hystrix*; L.

Germ. Stachelthier; Stachelschwein.
Fr. Porc-epic. *Port.* Ouriço-cacheiro.

GENERIC CHARACTERS.

THE head is rather short, with an obtuse and somewhat compressed snout, long whiskers, short rounded ears, and small eyes; the upper lip is cleft, and the tongue set with scaly spines. The covering of the body is partly of bristles and partly of prickles or spines. The neck is thick, the belly large, and the limbs of equal length; the anterior have four, and the posterior five digits, armed with long, stout, curved nails. The tail is either short or of moderate length, and not prehensile.

Dental System.

20 Teeth: { 10 Upper { 2 Incisive, 8 Molar. / 10 Lower { 2 Incisive, 8 Molar.

IN THE UPPER JAW the incisors are rounded and even in front, and they arise from the anterior and inferior part of the maxillary bone. The molars

are of nearly the same size from the first to the last, and they are especially remarkable for the elevation of the crown above the neck of the root. The outline they present is very irregular. In the young animal they are traversed with various degrees of irregularity, by grooves, which, after being worn to a certain extent, begin to be interrupted, and then they exhibit a depression in front on the inside, and another at the back part on the outside; in front, as at the back part, one or two ellipses are seen, the remains of primitive grooves or tubercles. In old animals we find teeth with only one depression, and in the middle, three or four insulated figures, more or less irregular.

In the lower jaw the incisors resemble those in the upper, and take root some lines below the condyles. The molars have a great general resemblance to those of the upper jaw, and a precise idea can only be obtained by actual inspection, as description cannot convey a knowledge of such irregular and variable forms as are presented at different stages in the course of attrition.

Species I.—*The Canada Porcupine.*

Hystrix Dorsata; L. Gmel.

Hystrix Dorsata: Erxl. Schreb. pl. 169, Sab. App. 664.
Hystrix Hudsonis: Briss. 128.
Cavia Hudsonis: Kleis, Quad. 51.
Hystrix Pilosus Americanus: Catesby, Car. App. 30.
Ursou: Buff. xii. pl. 52.

The American porcupine exhibits none of the long and large quills which are so conspicuous and formidable in the European species, and the short

spines or prickles which are thickly set over all the superior parts of its body are covered by a long coarse hair, which almost entirely conceals them.—These spines are not more than two inches and a-half in length, yet form a very efficient protection to our animal against every other enemy but man. Too slow in its movements to escape by flight, on the approach of danger, the porcupine places his head between his legs, and folds his body into a globular mass, erecting his pointed and barbed spines. The cunning caution of the fox, the furious violence of the wolf, and the persevering attacks of the domestic dog, are alike fruitless. At every attempt to bite the porcupine, the nose and mouth of the aggressor is severely wounded, and the pain increased by every renewed effort, as the quills of the porcupine are left sticking in the wounds, and the death of the assailant is frequently the consequence of the violent irritation and inflammation thus produced.

In the remote and unsettled parts of Pennsylvania the porcupine is still occasionally found, but south of this state it is almost unknown. According to Catesby it never was found in that direction beyond Virginia, where it was quite rare. In the Hudson's Bay country, Canada, and New England, as well as in some parts of the western states, and throughout the country lying between the Rocky Mountains and the great western rivers, they are found in great abundance, and are highly prized by the aboriginals, both for the sake of their flesh and their quills, which are extensively employed as ornaments to their dresses, pipes, weapons, &c.

The porcupine passes a great part of its time in sleep, and appears to be a solitary and sluggish animal, very seldom leaving its haunts, except in search of food, and then going but to a short distance. The bark and buds of trees, such as the willow, pine, ash, &c. constitute its food during the winter season; in summer, various wild fruits are also eaten by this animal.

Dr. Best, of Lexington, Ky. in a letter to the author of this work, observes that "the porcupine is seldom found in the state of Ohio, south of Dayton; but they are numerous on the river St. Mary. During winter they take up their residence in hollow trees, whence it appeared to me in several instances, from their tracks in the snow, they only travel to the nearest ash-trees whose branches serve them for food. In every instance which came under my observation, there was no single track, but a plain beaten path, from the tree in which they lodged to the ash from which they obtained their food. I cut down two trees for porcupine, and found but one in each; one of the trees also contained four raccoons, but in a separate hollow, they occupied the trunk, the porcupine the limbs."

The following are Hearne's observations on this species:—"Porcupines are so scarce to the north of Churchill river, that I do not recollect to have seen more than six during almost three years residence among the northern Indians. Mr. Pennant observes, in his Arctic Zoology, that they always have two at a time, one brought forth alive, and the other still-born, but I never saw an instance of this kind,

though in different parts of the country I have seen them killed in all stages of pregnancy. The flesh of the porcupine is very delicious, and so much esteemed by the Indians, that they think it the greatest luxury their country affords. The quills are in great request among the women, who make them into a variety of ornaments, such as shot-bags, belts, garters, bracelets, &c.* They are the most forlorn animals I know; for in those parts of Hudson's Bay where they are most numerous, it is not common to see more than one in a place. They are so remarkably slow and stupid, that our Indians, going with packets from fort to fort, often see them in the trees, but not having occasion for them at that time, leave them till their return, and should their absence be for a week or ten days, they are sure to find them within a mile of the place where they had seen them before."

The patience and ingenuity displayed by the Indian women in ornamenting dresses, buffaloe robes, moccasins, &c. can scarcely be appreciated by those who have never seen any of the articles thus adorned. We have already mentioned that these quills rarely exceed two inches and a-half, or at most three inches in length, and are not larger in circumference than a moderate sized wheat straw. Yet we find large surfaces worked or embroidered in the neatest

* Modus illis copulandi (testante HEARNE,) profecto singularis est. Femina super marem dorso recubantem, a capite usque ad caudam ambulat, donec genitalia mutuo tangunt, sic, spinis acutis evitatis, veneris suaviis, fruuntur; aliquando ambobus lateribus resupinatis, actum est.

and most beautiful manner with these quills, which are dyed of various rich and permanent colours. In making this embroidery they have not the advantage of a needle; but use a straight awl. Some of their work is done by passing the sinew of a deer or other animal through a hole made with the awl, and at every stitch wrapping this thread with one or more turns of a porcupine-quill. When they wind the quill near to its end, the extremity is turned into the skin, or is concealed by the succeeding turn so as to appear, when the whole is completed, as if but a single strip had been used. In other instances the ornament is wrought of the porcupine-quills exclusively, and is frequently extremely beautiful, from its neatness and the good taste of the figures into which it is arranged. In general, however, the strong contrast of colours is the most remarkable effect aimed at. On some of the articles of dress figures of animals, exhibiting much ingenuity, are formed by embroidering with these quills. The Philadelphia Museum, so rich in objects of natural history, also boasts a most splendid and valuable collection of articles of dress, and implements of peace and war, peculiar to the various aboriginals of our country. Whoever wishes to see to what extent the quills of the porcupine are employed by these interesting people, and also to form a better idea of the number of porcupines that must be found in the trans-Mississipian regions, may be fully gratified by visiting this great institution.

CHAPTER XIII.

Genus XXXI.—Hare; *Lepus*; L.

Fr. Lièvre. *Germ.* Hase.

Generic Characters.

The head is narrow and compressed, having a rather acute snout, large, prominent, laterally-placed eyes, and long ears, situated close together. The upper lip is cleft, and the inside of the cheeks covered with hair: in each groin there is a fold of the skin that forms a sort of pouch. The fore limbs are slender and short, and have five digits, which are below, covered with a soft, velvety hair; the posterior limbs are very long, and have four digits, the soles being covered with hair similar to that in the palms. The teats are from six to ten in number; the tail is very short and turned upwards.

Dental System.

28 Teeth: 16 Upper { 4 Incisive, 12 Molar. 12 Lower { 2 Incisive, 10 Molar.

It is known how anomalous the hares are in the order of *gnawers*, by the number and singular arrangement of their upper incisor teeth. They are equally so in the structure of the head, and in many

other organic peculiarities, which do not allow them to be naturally approximated to any other group of this order.*

In the upper jaw the anterior incisor is flat on its anterior surface, and unequally divided by a longitudinal depression, nearer to its internal than its external edge. Behind this tooth another small one is found, divided at its extremity by a transverse groove, and in very young individuals we find a third tooth behind the second, but it soon falls out, and the alveole disappears; these two last teeth are placed in the intermaxillary bones. The molars have nearly the same structure, but differ in size. They are twice as long as their breadth; the first, smaller than the succeeding one, exhibits two folds of enamel on its anterior surface, but all the parts of these rejoin, and are solidified together. The four following are of the same size, and divided longitudinally in their middle by two folds of enamel, which arise at their extremities and approach each other, so that the laminæ composing them, though entirely reunited, leave no intervening vacancy proper to be filled by the cortical matter. The internal fold is the most profound. The last molar, which is extremely small, appears to have no fold, and to be of a simple structure,—that is, it presents the form of a very elongated ellipsis, surrounded by enamel.

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* These animals have an exceedingly large cœcum, which has a spiral valve running though its whole length. Beneath the orbit of the eye there is, in the skull, a space at the inner angle, which is cribriform, or pierced by a great number of small holes.

In the lower jaw the incisor is smooth and flat. The molars are formed after the same system as those of the upper jaw, but differ slightly from each other. The first, which is the largest, has three sides on its external face, and a slight depression on its anterior face, although it is only divided into two parts by a deep fold of enamel, the plates of which reunite. The three following are similar: they are of the same size and divided by a deep fold of enamel, the plates joining each other only on the outside, which leaves a deep depression on their inner face. The fifth is a third smaller than the preceding, and divided into two unequal parts by two lateral grooves, the anterior of which is the largest.

Species I.—*The American Hare.*

Lepus Americanus; L., Gmel.

Lepus Americanus, Schreb. Natur. fig. 20, p. 20.
Lepus Hudsonius: Pall. Glir. pt. 1, p. 30.
American Hare: Penn. Arct. Zool. i. 109, No. 38, Hist. Quad. No. 243; Hearne, Journey, &c. 8vo. ed. 385; Sabine, App. to Franklin's Exped. 665.

[*Commonly, but improperly called Rabbit.*]

The American Hare is found throughout this country to as far north as the vicinity of Carlton House, in the Hudson's Bay country. According to the statement of Hearne "they are not plentiful in the eastern parts of the northern Indian country, not even in those parts that are situated among the woods; but to the westward, bordering on the south-

ern Indian country, they are in some places pretty numerous, though by no means equal to what has been reported of them at York Fort, and some other settlements in the Bay." In various parts of the Union this hare is exceedingly common, and large numbers are annually destroyed for the sake of their flesh and fur.

The timidity and defencelessness characteristic of the genus, are well illustrated in this species, which has no protection against its numerous enemies, and can escape by flight alone. Its peculiar colour must, however, minister to its safety, as it is so similar to the general colour of the soil as to require a close attention to distinguish the animal, which is usually passed without being observed by such as are not especially in search of it. Yet the swiftness and other natural advantages of the hare, insufficient to secure it from the artifices of man, or from being preyed upon by various beasts and birds, would not prevent the species from soon being extinguished, were it not for its remarkable fecundity.

During the day time the hare remains crouched within its form, which is a mere space, of the size of the animal, upon the surface of the ground, cleared of grass, and sheltered by some overarching plant; or else its habitation is in the hollowed trunk of a tree, or under a collection of stones, &c.

It is commonly at the earliest dawn, while the dew-drops still glitter on the herbage, or when the fresh verdure is concealed beneath a mantle of glistening frost, that the timorous hare ventures forth in quest of food, or courses undisturbed over the plains. Occasionally during the day, in retired and

little frequented parts of the country, an individual is seen to scud from the path, where it has been basking in the sun; but the best time for studying the habits of the animal is during moon-light nights, when the hare is to be seen sporting with its companions in unrestrained gambols, frisking with delighted eagerness around its mate, or busily engaged in cropping its food. On such occasions the turnip and cabbage fields suffer severely, where these animals are numerous, though in general they are not productive of serious injury. However, when food is scarce they do much mischief to the farmers, by destroying the bark on the young trees in the nurseries, and by cutting valuable plants.

The flesh of the American hare, though of a dark colour, is much esteemed as an article of food. During the summer season they are lean and tough, and in many situations they are infested by a species of œstrus, which lays its eggs in their skins, producing worms of considerable size. But in the autumnal season, and especially after the commencement of the frost, when the wild berries, &c. are ripe, they become very fat, and are a delicious article of food. In the north, during winter, they feed on the twigs and buds of the pine and fir, and are fit for the table throughout the season. The Indians eat the contents of their stomachs, notwithstanding the food is such as we have just mentioned.

The American hare never burrows in the ground like the common European rabbit; (*L. Cuniculus.*) When confined in a yard, our animal has been known to attempt an escape by scratching a hole in the earth near the fence or wall, but there are few wild animals, whatever may be their characters, that will not

do the same, under similar circumstances, though in their natural condition they may never attempt to burrow. Such is the fact in relation to the American hare, which never burrows while it is a free tenant of the fields and woods. It has been said that this animal also occasionally ascends trees, which must be understood solely of its going up within the trunks of hollow trees, which it effects by pressing with its back and feet against opposite sides of the hollow, ascending somewhat in the same manner that a sweep climbs a chimney.

The hare is not hunted in this country as in Europe, but is generally roused by a dog, and shot, or is caught in various snares and traps. In its movements our hare closely resembles the common hare of Europe, bounding along with great celerity, and would no doubt, when pursued, resort to the artifices of doubling, &c. so well known to be used by the European animal. The American hare breeds several times during the year, and in the southern states even during the winter months, having from two to four or six at a litter.

In summer pelage the American hare is dark brown on the upper part of its head, a lighter brown on the sides, and of an ash colour below. The ears are wide and edged with white, tipped with brown, and very dark on their back parts; their sides approach to an ash colour. The inside of the neck is slightly ferruginous; the belly and the tail is small, dark above, and white below, having the inferior surface turned up. The hind legs are covered with more white than dark hairs, and both fore and hind feet have sharp pointed, narrow, and nearly straight nails.

In winter the pelage is nearly twice the length of what it is in summer, and is altogether, or very nearly, white. The weight of the animal is about seven pounds.

This species is about fourteen inches in length. The hind legs are ten inches long, by which circumstance it is most strongly distinguished from the common rabbit of Europe.*

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* "The hare and rabbit so nearly resemble each other in form and structure, that it has puzzled the most experienced zoologists to assign definite distinguishing marks. Yet there are many circumstances in which they differ (besides the colour of their flesh when boiled, and their manner of escaping from their foes) in reference to their reproductive system. The nest of the hare is open, constructed without care, and destitute of a lining of fur. The nest of the rabbit is concealed in a hole of the earth, constructed of dried plants, and lined with fur, which is pulled from its own body. The young of the hare, at birth, have their eyes and ears perfect, their legs in a condition for running, and their bodies covered with fur. The young of the rabbit, at birth, have their eyes and ears closed, are unable to travel, and are naked. The maternal duties of the hare are few in number, and consist in licking the young dry at first, and supplying them regularly with food. Those of the rabbit are more numerous, and consist of the additional duties of keeping the young in a state of suitable cleanliness and warmth. The circumstances attending the birth of a hare are analogous to those of a horse, while those of a rabbit more nearly resemble the fox."—Flem. *Philosophy of Zoology*, ii. p. 140.

The *rabbit* is not a native of this country, but has frequently been introduced in a domesticated state, from England, &c. The species above described we have already stated to be improperly called "the rabbit."

Species II.—*The Polar Hare.*

Lepus Glacialis; Sab.

Lepus Glacialis: Leach. Miscel. Sabine, App. to Franklin, p. 664; Ib. App. to Parry's Voyage of 1819, 1820.

The Polar Hare is found in greatest abundance at the extreme northern part of this continent, along the southern coast of Barrow's strait, and in the North Georgian islands. Capt. Sabine, who found the animal in considerable numbers on Melville island, has pointed out, in the Appendix above quoted, (whence the following description is taken) the differences existing between this species and the *L. Variabilis*, with which it had been previously confounded.

The polar hare is larger than the alpine or varying hare, next to be described, and weighs about eight pounds. Its colour, in winter dress, is white, having the ears black at their tips and longer than the head. The nails are strong, broad and depressed.

"The ears are longer, in proportion to the head, than those of the common hare, (*L. Timidus*) and much longer than those of the alpine hare (*L. Variabilis.*) The ears of the common hare are usually considered one-tenth longer than the head, those of the present species are from one-fifth to one-seventh. The fore teeth are curves of a much larger circle, and the orbits of the eye project much more than those of either of the other species; the claws are broad, depressed and strong: those of the *L. Timidus* and *Variabilis* being, on the contrary, compressed and weak; the hind leg is shorter, in proportion

to the size of the animal, than in the alpine, (*Variabilis;*) the fur is exceedingly thick and woolly, of the purest white in the spring and autumn, excepting a tuft of long black hair at the tip of the ears, which is reddish brown at base; the whiskers are also black at the base for half their length. In some of the full grown specimens, killed in the height of summer, the hair of the back and sides was a grayish brown towards the points, but the mass of fur beneath still remained white. The face and the front of the ears were a deeper gray; the fur is interspersed with long, solitary hairs, which in many individuals were, in the middle of summer, banded with brown and white. The hares which Mr. HEARNE describes, in his northern voyage, as inhabiting the continent of America, as high as the seventy-second degree of latitude, are stated to weigh fourteen or fifteen pounds when full grown and in good condition. The largest hare killed at Melville island did not weigh nine pounds; were it not for this difference in size, they might be supposed, from other parts of their description, to be the same species."*

Through the kindness of that zealous friend of science, CHARLES L. BONAPARTE, we have had an opportunity of examining and preparing a description

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* In the Appendix to Franklin's Journey, p. 665, we have the following observations on this species:—"The polar hare appears to vary much in size, and consequently in weight:

of a hare, from specimens in winter and summer pelage, belonging to his valuable collection. This species, which appears to be the same with that indicated by Lewis and Clarke, and after them by Warden, has also been *proposed* as a new species, under the name of *Lepus Virginianus*. That it is a species distinct from the *L. Glacialis* and *Variabilis*, remains yet to be established, since differential characters have not been adduced to prove the fact.—We shall first give a description of the animal in summer and winter dress, and then examine whether any differential characters have been given, or, under existing circumstances, can be offered, to entitle it to rank as a new species.

The general colour of this hare, in summer dress, is a light reddish brown, which is lighter on the breast and head, becoming darker from the superior parts of the shoulders to the posterior parts of the body. The hairs are coloured in the following manner:—They are plumbeous at base, then light yellowish, then dusky, then reddish brown, and finally black at tip. The under jaw is white, and this colour extends backwards until opposite the bases of the ears. The belly and legs are white, faintly

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this, perhaps, may be caused by the quantity and quality of the food it can command. Dr. Richardson observed that the polar hare is never seen in woods; it frequents the barren grounds, living chiefly on the berries of the *arbutus alpina* and the bark of a dwarf birch. It sits, like the common hare, on the whole length of the metatarsal bones, but in running its hind feet make a round print in the snow, similar to that made by the fore ones."

tinged with light reddish brown; the tail is whitish, which colour is superiorly mingled with bluish or lead colour. The ears are externally bluish white, and darker at tip; internally they are of a faint reddish white.

The following measurements of a recent specimen of this animal, were carefully made by the distinguished individual before mentioned:

Total length,	2 ft.	7 in.
Height to the top of the fore shoulder,	"	10
——— to the top of the thigh,	1	2
Length of the head,	"	4
——— of the ears,	"	4
Distance from the eyes to the end of the nose,	"	$1\frac{3}{4}$
Length of the fore arm,	"	4
——— of the fore paw,	"	$2\frac{3}{4}$
——— of the thigh,	"	6
——— of the hind foot,	"	6
——— of the tail,	"	$1\frac{1}{2}$

In winter dress the general colour is pure white, the fur being long, soft, fine, and in greatest quantity upon the breast. The hairs in the summer, as in winter pelage, are plumbeous at base, but are then reddish, and at tip of a snowy whiteness. The ears are slightly tipped with dark lead colour, and edged within by brown and white hairs intermixed. The whiskers are entirely white, or black at base and white at tip. The feet are thickly clothed with hair, which conceals the slightly curved nails, which are long and narrow at base.

When we compare this animal with the polar hare, *L. Glacialis* of Sabine, and with the *L. Variabilis*,

or alpine hare, we shall be convinced that distinctive characters have not yet been given to establish the supposed new species, as well as that such distinctive characters are very few and difficult of discovery.

The essential or distinctive characters ascribed by Sabine to the polar hare, are as follows:—Colour white, ears black at tip, longer than the head; nails robust, broad and depressed.

The essential characters of the *L. Variabilis*, as given by Desmarest, are,—pelage grayish yellow in summer, white in winter; ears shorter than the head, and black at all times; tail white in winter and gray in summer.

The "characters essential" given of the animal under consideration as a *new species*, entitled *Lepus Virginianus*, are as follows:—"Grayish brown in summer; the orbits of the eyes surrounded by a reddish fawn colour at all times; ears and head of nearly equal length; tail very short."

As the colour of the pelage is common to several species, both in summer and winter, it is peculiarly insufficient as a differential character in the establishment of the proposed new species. The second character laid down in the last definition, concerning the permanent fawn colour surrounding the orbit, is incorrect. One of the specimens above described has the orbits of the eyes surrounded by a very different colour; neither is the statement, that the ears are *nearly* equal in length to the head, of any avail in establishing the specific difference, since the ears of the *Variabilis* are also *nearly* equal in length to the head, being somewhat shorter. If it be meant that the ears of the supposed new species are, in the

same sense, nearly of the length of the head, it is incorrect, since the head of the animal in its recent state measured four inches, and the ears were of the same length. The shortness of the tail is as characteristic of the *Variabilis*, in which it is but one inch and three-quarters, while the proposed new species has a tail one inch and a-half long.

In the present state of our knowledge, the only truly differential character that can be given is the equality existing between the length of the ears and head. The toe-nails differ from those of the polar hare described by Sabine, but they are very similar to those of the common hare, and may also be similar to those of the *Variabilis*, which are not minutely described, even by DESMAREST; hence no positive conclusion can be deduced. Neither can the relative height of the hind and fore parts aid in distinguishing this hare from the alpine, (*L. Variabilis*) in which the hind are to the fore parts as fourteen to twelve, while in the proposed new species the proportion is the same, being as twelve to ten; the polar hare (*L. Glacialis*) has the hind limbs proportionally shorter than the *Variabilis*, though their actual length is not given: this being equally true of the supposed new species, we cannot infer any specific difference therefrom. The weight of these hares is a circumstance equally inefficient in deciding this doubtful matter; the polar hare weighs from seven to nine pounds, (*Sab.*)—the alpine seven to seven and a-half, (*Penn.*)—the hare described by Lewis and Clarke, seven to eleven pounds. The weight given by the latter observers inclines us to

believe that this animal is the same as that described by HEARNE, as the varying hare, which SABINE says differs from the polar hare only in weight.*

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* The following is HEARNE's account of this animal:—"The *varying hares* are numerous, and extend as far as latitude 72° N., probably farther. They delight most in rocky and stony places, near the borders of woods, though many of them brave the coldest winters on entirely barren ground. In summer they are nearly of the colour of our English wild rabbit, but in winter assume a most delicate white all over, except the tips of the ears, which are black. They are, when full grown and in good condition, very large, many of them weighing fourteen or fifteen pounds; and, if not too old, are good eating. In winter they feed on long rye grass and the tops of dwarf willows, but in summer eat herries and different sorts of small herbage. They are frequently killed on the south side of Churchill river, and several have been known to breed near the settlement at that place. They must breed very fast, for, when we evacuated Prince of Wales' fort, in 1783, it was common for one man to kill two or three in a day, within three miles of the new settlement. But partly, perhaps, from so many being killed, and partly from the survivors being so frequently disturbed, they have shifted their situation, and at present are as scarce near the settlement as ever. The northern Indians pursue a singular method of shooting those hares; finding, by long experience, that these animals will not bear a direct approach, when the Indians see a hare sitting, they walk round it in circles, always drawing nearer at every revolution, till by degrees they get within gun-shot. The middle of the day, if it be clear weather, is the best time to kill them in this manner; for before and after noon the sun's altitude being so small makes a man's shadow so long on the snow as to frighten the hare before he can approach near enough to kill it."—8vo. ed. p. 385.

In the specimen in summer dress (which we have described in beginning this article) the tail is nearly white, and in the hares observed by LEWIS and CLARKE, presently to be quoted, the tail was likewise white during the summer. Should this colour of the tail prove to be uniformly permanent, it may be added to the only other differential character, drawn from the ears. But until more decisive evidence can be adduced, it will be safest to consider this hare as at most a variety of the alpine hare, the *Lepus Variabilis* of authors.

It is found throughout the mountainous regions of the Union, and on the plains and in the woods of the western territories. To the north it is known as far as observation has yet extended. LEWIS and CLARKE, in the second volume, p. 178, of their extremely interesting journal, give the following account of this animal:—"The hare on the western side of the Rocky Mountains inhabits the great plains of the Columbia. On the eastward of those mountains they inhabit the plains of the Missouri. They weigh from seven to eleven pounds; the eye is large and prominent, the pupil of a deep sea-green, occupying one-third of the diameter of the eye; the iris is of a bright yellow and silver-colour; the ears are placed far back and near each other, which the animal can, with surprising ease and quickness, dilate and throw forward, or contract and hold upon his back at pleasure; the head, neck, back, shoulders, thighs, and outer parts of the legs and thighs, are of a lead colour; the sides, as they approach the belly, become gradually more white: the belly, breast, and inner parts of the legs and thighs

are white, with a light shade of lead-colour; the tail is round and bluntly pointed, covered with white soft fur, not quite so long as on the other parts of the body; the body is covered with a deep, fine, soft, close fur. The colours here described are those which the animal assumes from the middle of April to the middle of November; the rest of the year he is of a pure white, except the black and reddish brown of the ears, which never changes. A few reddish brown spots are sometimes mixed with the white, at this season, (February 26) on their heads and the upper parts of their necks and shoulders; the body of the animal is smaller and longer, in proportion to its height, than the rabbit; when he runs he conveys his tail straight behind, in the direction of his body. He appears to run and bound with surprising agility and ease: he is extremely fleet, and never burrows nor takes shelter in the ground when pursued. His teeth are like those of a rabbit, (*L. Americanus*) as is also his upper lip, which is divided as high as the nose. His food is grass, herbs, and in the winter he feeds much on the bark of several aromatic herbs growing on the plains. Capt. Lewis measured the leaps of this animal, and found them commonly from eighteen to twenty-one feet; they are generally found separate, and never seen to associate in greater numbers than two or three."

Warden, in a note to his "Description des Etats Unis," p. 632, says, "the varying hare of the southern parts of the United States is distinguished from the American rabbit (*Lepus Americanus*) by changing from a gray brown, which is its colour in spring and summer, to a full white in winter. Its ears are

also shorter and marked with black, and its legs more slender. The largest varying hares are about eighteen inches long, and weigh from seven to eight pounds. They are very prolific, as the female litters several times a year, having three or four young each time. The flesh of this animal is represented to be agreeable and nutritious. It frequents the marshes and prairies, but never burrows; its colour is similar to that of the European rabbit, and the female equally conceals her young from the male. When pursued, they mount as high as possible within a hollow tree."

CHAPTER XIV.

Order IV.—Bruta;* L. *Animals destitute of Cutting-Teeth.*

In North America no living animal belonging to this order has yet been found, but gigantic fossil remains of extinct species have been occasionally disinterred in different parts of the Union. The circumstance first stated may appear the more singular when the fact is recollected, that the greater num-

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* Brisson first established an order, under the title of *Edentata*, which comprised the animals having no teeth; he made a second order, of *Dentata*, embracing those possessed of molars: which division was adopted by Lacepede. Storr disapproving this arrangement, formed a single order of all these animals, which he called *Mutici*, and Boddaert subsequently changed the name to that of *Edentes*, which was afterwards changed to *Edentata* by Cuvier. Various changes have been proposed by other writers, founded on their peculiar views, (of the structure, &c. of these animals) which it is needless to detail. We have adopted the Linnean name for the order, as it conveys no incorrect idea, which all the others do, by calling the order Toothless, when only one genus is in that predicament. The place in the system of classification is that given to the order by Cuvier, because these beasts have some analogy to the digitigrade animals, in the circumstance of their toes being terminated by large and long claws, &c.

* Vedi Ranzani, *Elementi di Zoologia*, tomo. IIdo parte IIda. p. 473.

ber of the living genera and species, comprised by this order, are, at present, inhabitants of the southern division of this continent.

The animals of this order are characterized by the exceeding slowness of their movements, dependant on the singular structure and proportions of their limbs. They have the orbits of the eyes and the temporal cavities opening into each other, so as to form one cavity in the skeleton; and their limbs are terminated by digits, (varying in number in different genera and species) armed with large and hoof-like claws. Such of the genera as have molar or jaw-teeth, feed on bark of trees, &c. others, entirely destitute of teeth, feed exclusively on insects. Some of them use their claws for climbing and clinging to the branches of trees; others for the purpose of burrowing.

FAMILY I.—TARDIGRADA: *Sloths.*

GENUS I.—MEGATHERIUM; C. *Extinct Giant Sloth.*

GENERIC CHARACTERS.

Unlike the living members of this family, the present genus has complete zygomatic arches, yet it again closely resembles the existing genera in having at the anterior basis of the zygoma, a large descending process. The bones of the upper jaw are much prolonged; the nasal bones are very short: the lower jaw has very large ascending branches, and at its anterior extremity, or chin, it is salient, and hollow

ed within. The spine, composed of twenty-six vertebræ, has seven belonging to the neck, sixteen to the back, and three to the loins. It cannot be positively stated that these animals had no tail, though it is probable;—if it did exist, it is presumed to have been very short. The posterior limbs exceed the anterior in size considerably; all the feet have five toes, yet three only on the fore feet are provided with large claws, the other two being rudimental. On the hind feet but one toe is furnished with an enormous claw; the other four are nearly rudimental.

Dental System.

16 Teeth: { 8 Upper / 8 Lower } Molars.

"The twelve posterior teeth are larger than the others, each of them being nearly two inches square; they present rounded angles, and between each of these angles there is a small canal. Each tooth has four angles, two internal and two external. The lower part, which is imbedded in the alveolar process, diminishes gradually, becoming only two inches broad, of a square form, having beneath a pyramidal cavity separated by four points, which buries itself sufficiently forward in the tooth. The four first teeth weighed exactly twenty ounces; the others as much as twenty-six."*

* Don Juan B. Bru; description of the skeleton from Paraguay, in the Madrid Museum; translated by Bonpland in Cuv. oss. foss. tom. iv.

"Their remarkable structure, so much unlike any before observed, is still more deserving of particular description. The tooth is covered externally with a coating of enamel, extremely thin, and uniformly so on all sides, and which does not extend over any part of the crown. Within is a coating of bone or ivory, which, at the sides of the tooth, is as thin as the enamel; but where it is parallel to the cutting edges, is nearly a-quarter the thickness of the whole tooth. Enclosed within this is a second coating of enamel, which, like the first two, has two sides very thin. The other two sides are more than a line thick, and terminate in the cutting process, which by this means are kept constantly sharp and prominent, by the wearing away of the softer ivory on each side of them. Where these laminæ of enamel terminate on the anterior side of the higher process, may be observed a semilunate truncation, which is not seen on the lower process, although terminated in a similar manner. The whole solid part of the tooth thus represents a prism of bone, enveloped within three *cases*, two of enamel, and the third of a substance similar to itself."*

[That the reader may be better prepared to understand the peculiar character of these fossil remains, we subjoin Cuvier's observations on the construction of the existing animals, to which these extinct species were closely allied, and which they must have resembled in all their general habits.

* Annals of the Lyceum of Natural History of New York, vol. i. p. 114. A highly interesting paper by W. Cooper on the Megatherium found in Georgia.

as well as in conformation. This comparison may also prove of advantage to the inquirer, (independent of satisfying him of the correctness of the opinions advanced, relative to the similarity of these animals) should it awaken his curiosity to become better acquainted with the works of the great naturalist quoted. His writings, though principally occupied with the relics of former worlds—with animals that ceased to be before the foundations of human society were laid, nevertheless overflow with the energies of an immortal intellect, and expand the mind of the student with those sublime ideas of the God of Nature, which are not to be equalled by any mere effort of imagination, since they are inspired by the most extraordinary facts, beheld under the powerful illumination of disciplined genius.

"In considering these beings, we find so few relations with ordinary animals—the general laws of existing organizations apply so little to them—the different parts of their bodies are so much in contradiction to the rules of co-existence established throughout the animal kingdom, that we might really believe them to be the remains of another order of beings, the living fragments of that antecedent nature, whose other ruins we are obliged to seek in the bosom of the earth, which by some miracle have escaped the catastrophies that destroyed their cotemporary species.

"With the solitary exception of the elephant, there is not, perhaps, among all the quadrupeds, an animal which so widely departs from the general plan of nature, in the formation of that class, as the sloths; still, the deviations from that plan correspond with

each other so reciprocally as to correct their bad effects, and produce a concordant whole; but in the sloths, each singularity of organization appears to have no other result but weakness and imperfection, and the inconveniences they cause the animal are not compensated by any advantage.

"The mere aspect of the skeleton of the *ai*, (three-toed sloth) in some sort indicates deficiencies of proportion. The arms and forearms taken together are almost twice as long as the thigh and leg, so that when the animal moves on all four limbs it is obliged to crawl upon its elbows, and when it raises itself upon its claws, the entire hand may still be placed against the ground. There are some apes alone which approach this disproportion; but they often keep themselves erect, or walk with the aid of a staff, which cannot be done by the *ai*, since its hind feet are so peculiarly articulated that they cannot sustain the body. The pelvis, moreover, is so large, and the cotyloid cavities (or sockets for the heads of the thigh bones) are turned so far backwards, that the knees cannot be brought together, and the thighs are kept forcibly separate.

"Animals, when they run, receive their principal impulsion from their hind feet: hence, the best runners have the longest hind legs, as the hares, jerboas, &c. The length of the fore legs serve merely to embarrass, and hence crabs are forced to move backward. Sloths can scarcely employ their fore limbs, except for the purpose of clinging to objects and then dragging forwards their hinder parts.

"In the other quadrupeds, the *os sacrum* is only attached to the ossa ilia, or haunch bones, by a small

portion of its sides in front; all the rest is free, and the interval between the posterior part of the sacrum and ossa innominata is vacant, for the reception of the muscles and other soft parts, bearing the name of the great ischiatic notch. In the sloth there is a second posterior union between the sacrum and tuberosity of the ischium, and instead of the ischiatic notch there is nothing but an opening like a second obturator foramen.

The joint which attaches the hind foot and leg, "appears to be expressly arranged to deprive the animal of the use of the foot." In other animals the articulation is such as to allow the foot to be flexed upon the leg, but the foot of the sloth turns upon the bones of the leg "like a weathercock upon its pin, but cannot be flexed. Hence it results that the body of the foot is nearly vertical when the leg is so, and that the animal cannot place the sole of the foot on the ground unless by separating the leg so far as to render it almost horizontal. From these two peculiarities the absolute weakness of the foot is derived, and the total impossibility of its affording a solid point of support to the body." On the fore and hind feet "the skin envelopes all the parts except the nails, which are separate, and the whole of the remainder of the digits is united, being without interval or mobility between them; they, therefore, can only be flexed or extended together.

"The nails of the sloth are of an enormous length, and the dreadful weapon they furnish is doubtless the mean by which these animals defend themselves with sufficient success to compensate for all the disadvantage of the rest of their organization. Nearly

as sharp as those of the cat, it is necessary for their preservation in that condition that they should be protected from friction against the ground. It is by withdrawing them between their toes, having the points turned upwards, that those of the cat are preserved. The sloths cannot do the same, because their digits, being united by the integument, leave no interval; besides, these long reverted points would be very inconvenient, and might wound the throat and belly. When not in use they are kept recurved, and placed with their convexity on the ground; this, as in the cat, is effected without fatigue to their muscles, and by the simple elastic action of the ligaments: the muscles have only to act to extend them.

"From this difference, another results in the form of the articulation. The last phalanges of the cat, like those of the sloth, are at the back part hollowed into an arc of a circle, since they must move as pullies upon the next to the last bone. But in those of the cat the most salient part of the arc is below; in the sloth it is above, always on the side towards which the nail is not carried. By this circumstance we may distinguish, at the first glance, even a single phalanx of either of these genera. We may also distinguish them by the osseous sheath which retains and overlaps the base of the nail. Both genera equally have them, because both require solidity in so long a weapon; but in the sloth it is the lower part of this sheath which is the most prolonged, while in the cat it is rather the superior part."*]

* Recherches sur les Oss. Foss. tom. iv.

Species I.—*Cuvier's Giant Sloth.*

Megatherium Cuvieri.

Mégathére: C. Ann. du Mus. v. 176, pl. 24, 25. Recherches sur les Ossem. Foss. tom. iv. Bru, Descr. &c. trad. par Bonpland, Ejusdem, tom. iv. Descr. d'un squelette conservé dans le Mus. de Madrid; trad. de Garriga. Mitchill; Ann. of the Lyceum of Nat. History of New York, vol. i. Cooper on the Megatherium of Georgia, Ann. Lyceum, vol. i.
Megatherium Cuvieri: Desm. Mammal. 365.

The first discovered skeleton of this extraordinary animal was obtained from some excavations made on the banks of the river Luxan, near a town of the same name, situated about three leagues W. S. W. of Buenos Ayres. It was found at the depth of a hundred feet from the surface, in a sandy soil, and is the most perfect specimen of this animal yet procured. It was sent to Spain by the viceroy of Buenos Ayres, the Marquis of Loretto, where it was mounted in the museum of Madrid by Don. J. B. Bru, who first published a description of it. Another specimen was sent to the same cabinet in 1795, from Lima, and a third was discovered in Paraguay.* The only skeleton yet found in North America was first indicated by our celebrated countryman, Dr. Mitchill, and subsequently more fully detailed by that ardent votary of natural science, W. Cooper, of New York, in the work above quoted. Having but a few mutilated fragments of this skeleton in the cabinets of this country, it is impossible, by describing them alone, to give the reader any proper idea

* Garriga, as quoted by Cuvier.

of the animal. We shall therefore introduce CUVIER's account of the species, drawn up principally from the work of Garriga, and add thereto the observations made on the American specimen recently discovered in Georgia.

"A first glance at the head of the megatherium gives us the most marked relations with that of the sloth, especially the *ai* (three-toed sloth.) The most striking feature of resemblance is the long descending apophysis placed at the anterior base of the zygomatic arch. It is proportionally as long in the ai as in the megatherium; but the latter has the zygomatic arch entire, while in both species of sloth, even when adult, it is not continuous.

"The ascending branch of the lower jaw sufficiently resembles that of the sloth, but its inferior part forms a convexity, to which we find but a slight resemblance even in that of the elephant. The osseous snout is more salient in the megatherium than in the *ai;* this arises from an advance of the symphisis of the lower jaw, (chin) which is also found in the two-toed sloth, (*unau*) and from a corresponding advance of the intermaxillary bones.—The bones of the nose are very short, which, after the example of the elephant and tapir, might lead us to suspect that this animal had a trunk.

"This might also be inferred from the multitude of holes and small canals with which the anterior part of the snout is pierced, which must have served to give passage to vessels and nerves destined to nourish some organ of considerable size. However, if such a trunk existed, it was doubtless very short, judging by the length of the neck, which appears

very natural, and not owing to the introduction of vertebræ, belonging to larger individuals in forming the skeleton. The head not being disproportionately large, and especially being without tusks, a long neck would not be as prejudicial as it would have been in the elephant.

"The molar teeth are four in number, on each side, both above and below, as in the *ai*, and, like the teeth of that species, of a prismatic form, and the crown traversed by a groove. They are only closer together, and have no pointed canine in front, as the *ai* has one at least in the upper jaw, and the unau in both upper and lower. Yet that is scarcely sufficient to distinguish a genus, for in the *unau* itself the canines differ little from the molars, which are as pointed as in that species.

"If the number of seven cervical vertebræ, seen in this skeleton, be correct, as analogy with other animals induces us readily to believe, the megatherium differs much in this respect from the three-toed sloth, which itself is separated from all known quadrupeds by the length of its neck. The megatherium has sixteen dorsal vertebræ, and by consequence sixteen ribs on each side, and three lumbar vertebræ. The number is exactly the same in the *ai*.

"The relative proportion of the extremities is not the same as in the sloth, where the anterior have nearly double the length of the posterior limbs: in this animal the inequality is much less. But in return, the disproportionate thickness of the thigh and leg bones (indications of which are found in the sloths, tatous, and especially the pangolins) is carried here to an excessive degree, the thigh-bone being

in height only double its greatest thickness, which renders it larger than that of any other animal known, not excepting the mastodon.

"This general disposition of the extremities leads to the conclusion that this animal had a slow and equal gait, and advanced neither by running nor leaping, like animals having the fore limbs shorter, nor in crawling, like those which have them longer, and especially the sloths, to which they otherwise are so closely similar. The shoulder-blade has generally the same proportions as those of the sloths.—It has a clavicle, as in one of them, (the two-fingered or *unau*) which, together with the length of the phalanges supporting the nails, proves that this animal also employed its fore feet to seize, and even to climb with. The presence of clavicles separates our giant sloth from all the animals which might be confounded with it on account of their size, as the elephant, rhinoceros, and all the large ruminants, none of which have these bones.

"The arm of the megatherium is very remarkable for the breadth of its inferior part, which is owing to the great surface of the spines placed above its condyles. Hence, the muscles which originate there, and serve, as is known, to move the hand and fingers, must have been very considerable; this is another proof of the great use made by our animal of its inferior extremities. This great breadth of the lower part of the humerus is peculiarly found in the ant-eater, which is known to employ its powerful claws to suspend itself from trees, or to tear open the solid nests of the termites. It is in the ant-eater three-fifths of its length—while in our animal the breadth is

one-half; which is also the proportion in the long-tailed scaly ant-eater, or *phatagin*. In the rhinoceros this breadth is only a third, and in the elephant a fourth, of the length. Ruminant animals, which scarcely make any use of their toes, have hardly any thing of these spines.

"The length of the olecranon (point of the elbow) must have given to the extensor muscles of the forearm, an advantage which they have not in the sloths, whose olecranon is extremely short, which contributes not a little to the imperfection of their movements. The radius turns freely upon the ulna; but it should be remarked that this bone has been inverted in the skeleton, and the figures published represent it in this erroneous manner. The shortness of the metacarpus shows that the palm was entirely placed on the ground in walking. The digits, which were apparent and armed with nails, were three in number, and the two others concealed under the skin, as there are two in the ai, three in the *unau* and two fingered ant-eater.

"The last phalanges were composed of an axis, which carried the claw, and of a sheath which enclosed its base absolutely, as in the great clawed animals compared with this. But the bones of the metacarpus were not solidified together, as they are in the *ai*. The proportion of these bones, as well as those of the *megalonyx*, (*Jefferson's giant sloth*) are very different from those of the sloths, being the same as in the ant-eaters.

"The pelvic bones are very different in our animal from those of the kindred species. The haunch bones are the only ones preserved in the Madrid

skeleton; they form a half pelvis, broad and hollowed out, the mid-plane of which is perpendicular to the spine, resembling somewhat that of the elephant, and especially of the rhinoceros. The broad part of these bones have a peculiarly striking analogy with that of the latter animal, by the proportion of its three lines; but their narrow part, and near the cotyloid cavity, is much shorter. This form of pelvis indicates that the megatherium had a large belly, and accords, with the form of the teeth, to indicate that its subsistence was vegetable matter.

"The pubis and ischium are wanting in the Madrid skeleton, but, in my opinion, these were lost at the time of the exhumation. However, if this defect be natural to the species, it is still in an *edentous* animal (the two-toed ant-eater) that we find the first, though a slight indication of it. The ossa pubis and ischium of this ant-eater do not unite in front, and remain always separate.

"The tibia and fibula are united by bony matter at their two extremities, a circumstance absolutely peculiar to this animal; they present also by their union a disproportionately broad surface. In this respect the leg of the megatherium resembles considerably that of the *ai*, which is very broad, because its two bones each form a convexity on their sides, thus separating from each other. The figures lead to the belief that the articulation of the leg and foot is not so singular as it is in the *ai*, and that it is much more solid.

"The megatherium having a broad astragalus, articulated with a tibia equally so, and strengthened farther by the lateral position of the fibula, stood

more solidly than the sloths, and in this respect must have resembled most other quadrupeds.

"We find but a single toe on the hind feet of the Madrid skeleton, which was armed with claws; but in this respect I think there is less certainty than relative to the fore feet; especially as the figures represent but two other toes, which have no claws; and my researches have uniformly established as a rule without exception, that all unguiculated animals have five digits, whether externally visible, concealed beneath the skin, or reduced to simple osseous rudiments.

"The tail is wanting in the Madrid skeleton, and the smallness of the posterior face of the body of the sacrum, leads to the conclusion, that it was very short in this animal.

"The comparison of the bones of the megatherium and megalonyx, (Jefferson's giant sloth) results in establishing almost the absolute identity of forms, at least in the parts yet discovered of the latter; but the size is different. The bones of the megatherium are a third larger than those of the megalonyx, and as the latter bear all the characters of the adult age, we can only attribute the difference of size to difference of species: we may add that the claw-sheaths are longer and more complete in the last phalanges of the megatherium. These two animals then should form two species of the same genus, belonging to the *Edentous* family, being intermediate to the sloths and ant-eaters, though nearer the former than the latter."*

* Oss. Foss. tom. iv.

After this long extract from CUVIER, we deem it most advantageous to the reader to present the account of the fragments of the North American specimen described in the Annals of the Lyceum of Natural History of New York, in a paper entititled "On the Remains of the MEGATHERIUM recently discovered in Georgia, by WILLIAM COOPER." In giving this paper nearly entire,* we feel satisfied that its zealous and scientific author will lose nothing by having his researches on this subject immediately contrasted with those of the illustrious zoologist aboye quoted.

"It has been already announced that remains of the great fossil animal of Paraguay exist within the limits of the United States, and under a latitude nearly as far north, as they have hitherto been found south of the Equator. We are indebted for the first intelligence of this discovery, which possesses so much interest for the lovers of natural science, to our learned associate, professor MITCHILL, distinguished by his previous contributions to the knowledge of the fossil productions of this country. In a paper contained in the present volume of these Annals, that gentleman has given an account of two fragments of teeth brought to him from an island on the sea-coast of Georgia, which, at the same time that they differed totally from those of any quadruped now known to exist, presented the most striking resemblance to those of the *Megatherium*. To an animal

* We have already quoted, in the dental system of this species, a part of this paper. The comparison with BRU's description, &c. not being necessary at present, is also omitted.

of this very extraordinary, and now extinct, species, he accordingly does not hesitate to refer them.

"The information thus given, however, was calculated rather to stimulate than to satisfy the curiosity of naturalists. Although the fact of these remains existing in North America might perhaps be considered as thereby established, yet its connexion with the most difficult problems in zoology and geology rendered it highly desirable to obtain other and more entire parts of the skeleton, and with them to institute a more extensive comparison. By means of this we might expect to discover any difference possibly existing between them, or else to determine, in the most unquestionable manner, the specific identity of the animal of Georgia with that of Paraguay.

"These considerations induced me to address a letter to my friend, *Dr. Wm. R. Waring*, of Savannah, begging him to make inquiry whether any more of these relics had been found, and, if possible, to procure me some of them. His answer informed me that his friend, *Dr. Joseph C. Habersham*, of the same place, had, with much trouble, and at some expense, assembled a collection of the bones found in the marshes of Skidaway Island, and at his request consented to allow them to be sent to this city, under the condition that they should be placed where they might be publicly viewed. They were transmitted to me in the month of March last, and in compliance with the wishes of the owner, are now deposited in the cabinet of the Lyceum.

"The collection was found to consist of parts of several members of the skeleton, which, as nearly as

their very mutilated and disconnected state would enable me to determine, were as follows:

"A portion of the posterior part of the *right* side of the lower jaw.

"Another portion which had been continuous with the preceding.

"A considerable portion of the anterior part of the same jaw.

"A fragment of the *left* side of the same jaw, about three inches square.

"Five fragments belonging to three different teeth.

"The vertebra dentata, with nearly one half broken off.

"Three other vertebræ, two of which appear to be dorsal, and the third either the last dorsal or the first lumbar. None of these are entire.

"A fragment undetermined, but supposed to be of the ilium.

"Eight pieces belonging to three or four different ribs. Three of these pieces have the heads attached to them, and two seem to have belonged to the left side, and the remainder to the right.

"The head of the lower extremity of the humerus, with both condyles nearly entire.

"Two pieces with a concavity at one end, perhaps the superior parts of a radius and ulna.

"A bone supposed to be tarsal, much broken.

"Two carpal bones adapted to each other.

"The heads of both femora; and a fragment, apparently the lower condyle of a femur.

"Part of a bone about seven inches long, supposed to be part of a fibula.

"Besides these were four or five other small pieces of bone, but so imperfect as not to be easily referred to their proper places in the skeleton.

"In addition to the foregoing should be enumerated the two fragments of teeth from which professor Mitchill drew up his description. On being compared with Dr. Habersham's collection, one of them was found to correspond with a fragment supposed to be of a *fourth* molar, of which it formed the posterior process. The other, as it fitted with great exactness into what remained of the socket of the *third* molar, appeared to have occupied that place in the jaw. Thus it is rendered extremely probable that all the relics of the *Megatherium* yet discovered, as far as we know, in North America, have belonged to a single individual.

"I shall first endeavour to bring together some of these fragments so as to show what has been their original state; after which they may be compared with the figure and description of the animal of Paraguay, as given by M. Cuvier in the *Annales du Museum*, vol. v., and in the *Recherches sur les Ossemens Fossiles*, vol. iv. first edition.

"*Restoration of part of the lower jaw.*—A and B (see plate) formed one continuous piece. Of this there can be no doubt, as the edges of the fracture, though very irregular, correspond perfectly with each other. These two portions compose the greater part of the *right* side of the lower jaw, and contain parts of the sockets of all the four molar teeth.

"The plate represents two views of the jaw as partly restored, reduced to one-fifth their natural

size. Fig. 1, is an oblique view of the inside of the jaw. Fig. 2, a profile of the outside. The dotted line represents the part supposed to be broken off.

"C also belongs to the lower jaw. It consists of the anterior part, comprising the symphysis, with part of the elongation, and parts of the sockets of the two first molars. It has been continuous with B.

"D (not in the plate) is a fragment of the *left* side of the same jaw. This is evident from its containing parts of the sockets of the two last molars, part of the opening for the passage of the maxillary vessels, and the origin of the ascending branch of the jaw.

"The teeth had fallen out of all the sockets except one, which contained the body of the second molar with the crown and fangs broken off, apparently by recent violence. I attempted, therefore, to find the places of the four remaning teeth. Two of them I perceived to be alike in all respects, and therefore concluded that they had occupied corresponding situations in opposite sides of the jaw. Both are broken in two across, and consist of the crown and part of the body, as far down as below the commencement of the internal pyramidal cavity. The longer of the two is about four inches, the other somewhat less. On trying the first of these, it was found to fit with great exactness into the socket, of which part remains in B, and part in C, that is, the socket of the *first* molar. This, it may be observed, corroborates the approximation of these two fragments. Its form also showed this to have been its place; its diameter in the direction of its cutting edges being less than the contrary diameter, and its

being narrowed anteriorly, proved its situation to have been in the thinner and more tapering part of the maxillary bone.

"The *second* molar of the same (that is, the *right*) side, remained in its socket as already mentioned. It is remarkable for its rhomboidal form, the diagonal through its left anterior internal, and right posterior external angle, being the greatest.

"The remaining two teeth appeared to belong to the *left* side of the same jaw. One of them I conjectured to be the *third;* 1st, from its fitting into a part of this socket remaining in D; and 2dly, from its form, which shows the passage between the rhomboidal figure of the second molar, and the flattened shape of that which I suppose to be the *fourth*. This last is more flattened, that is, broader in the direction of its cutting edges than any of the others; and from this, as well as from its agreeing with the form of the fourth socket, partly remaining in D, I have referred it hither. This tooth may, however, have belonged to the upper jaw.

"The fragments of teeth in Dr. Habersham's collection, for there is not one entire, agree with Bru's description of those in the skeleton of Madrid, so far, at least, as it is given in the French abridgment. There are the sockets of four in the right lower side, and consequently eight teeth in all, in the lower jaw, the six posterior being the greatest. They are square, with rounded angles, and a groove between on the inner and outer sides, and are longitudinally striated. The inferior pyramidal cavity may be observed with advantage in the right second molar, which remains in the socket: but the terminating points are broken

off from this as well as from all the others. Consequently, we are not enabled to ascertain their precise length, but it appears to have been at least seven inches, and probably more.

"The heaviest of our teeth, which is the first of the right side, weighs nine and a-quarter ounces. The fourth of the left side weighs nine ounces. To make them agree with the weights of the corresponding teeth, as stated by Bru, we must suppose that more than half has been broken off the former, and from the latter nearly two-thirds. This, from a comparison with the sockets, I should hardly suppose to be the case, at least with the latter.

"The peculiar form of the crown of these teeth is not well represented in any figure I have seen, excepting that given by Professor Mitchill, to which the reader is referred. Their posterior crest is higher than the anterior. The posterior crest is known by the curvature of the tooth corresponding with that of the socket. This peculiarity does not appear in the figure in the '*Ossemens Fossiles*,' but rather the contrary.

"Fig. 3 represents a transverse section, natural size, of one of the first molars, showing the arrangement and relative thickness of the coats.

"Fig. 4, a longitudinal section of part of a larger tooth, showing the manner in which the interior enamel terminates the cutting process.

"Of the four vertebræ, three have little remaining besides the body, the processes being almost all entirely broken off. The other, which appears to be one of the dorsal, perhaps the third, is tolerably entire. It agrees with Bru's description of those of

the *megatherium*, excepting that I am not able to find the two holes which he describes in the atlas, and which, he says, are common to all the other vertebræ. As, however, this bone is much incrusted with various shells, they may possibly be covered or filled up.

"The ribs, also, are too much injured to afford any very distinctive characters. Neither can I observe any thing peculiar in the condyles of the humerus, as we have supposed them to be, for nothing more of this bone remains besides the inferior articulating extremity. The remarkable enlargement described in the Madrid skeleton is entirely wanting. The two fragments, conjectured to be the superior extremities of the radius and ulna, are in the same state, and present nothing but smooth and even concavities, with their edges partly broken. That supposed to be the radius exhibits on one side a smooth facet, where it may have played upon the ulna.—One of these pieces is six, the other four inches long; the diameter of their cavities about four inches.

"Of the two supposed to be carpal bones, the first, which is of a triangular figure, is the smaller. One side is convex and the other concave, with a slight elevation crossing it about the middle, which adapts itself to a corresponding depression in the other bone. It measures nearly five inches in length, and nearly three and a-half in breadth, and is about an inch thick. The second is of a singular figure: one side is convex, as in the first; the other side has one half concave, while the other half swells out into a hemispherical knob. Its outline is quadrangular, and it is a little longer and broader than the

first, with its concave end about as thick, and the other nearly three times that thickness, measuring through the knob.

"The heads of the two femora are both nearly entire, and would perhaps be sufficient of themselves to prove the identity of our animal with the South American species. They are, as observed by M. Bru, 'perfectly spherical, and with a superficies very smooth,' and measure full twenty-three inches in circumference. The dimensions of the skeleton of Madrid are not given in detail in the French abridged description. Even if we had not the evidence afforded by the teeth, these huge condyles would indicate an animal of much superior bulk to the *megalonyx;* for we can hardly imagine that a creature not larger than an ox, which is conjectured to have been the size of this quadruped of Virginia, could be furnished with thigh-bones of such disproportionate bigness. Indeed, they would seem calculated to encumber rather than support even the *megatherium,* whose size is supposed by M. Cuvier to have equalled that of the *rhinoceros.*

"The other fragments being small and much broken, nothing satisfactory could be determined with respect to them.

"My inquiries have not, as yet, enabled me to give any very precise information respecting the locality of these bones, or the character of the formation in which they were found. Their appearance, however, indicates that they have been overflowed by the sea; and they seem to have had one side imbedded in the earth or mud, while the other was washed by the salt water. They are thinly in-

crusted in some places with *Flustræ* and other zoophytes, and have recent shells of the genera *Balanus, Ostrea* and others, adhering to them. All are remarkably hard and heavy, and of a deep black colour. They do not retain any part of their animal matter.

"Drs. Waring and Habersham state that these bones are still to be procured in *great quantity*, by some labour and expense, at the same place. They add, that bones of the same kind may be obtained at two other places, one called Whitebluff, said to be also on the seacoast; the other is at some distance up the Savannah river. We may hope, through the zeal and exertions of the same gentleman, to whom the scientific public generally is so much indebted for the preservation of the remains which have formed the subject of these remarks, to have these interesting deposites further explored; and in a manner worthy of the great questions, which a proper examination of their contents would contribute so much to elucidate."

Species II.—*Jefferson's Giant Sloth.*

Megatherium Jeffersonii.

Megalonyx: Jefferson, Transact. of the Am. Philos. Society, iv. 246.
Megalonyx: C. Annals du Museum, v. 358, pl. 23; Recherches sur les Ossemens Fossiles, iv.
Megatherium Jeffersonii: Desm. Mammal. 366, Sp. 580.

To the author of the Declaration of American Independence the scientific world is indebted for the first account of the extraordinary and interesting re-

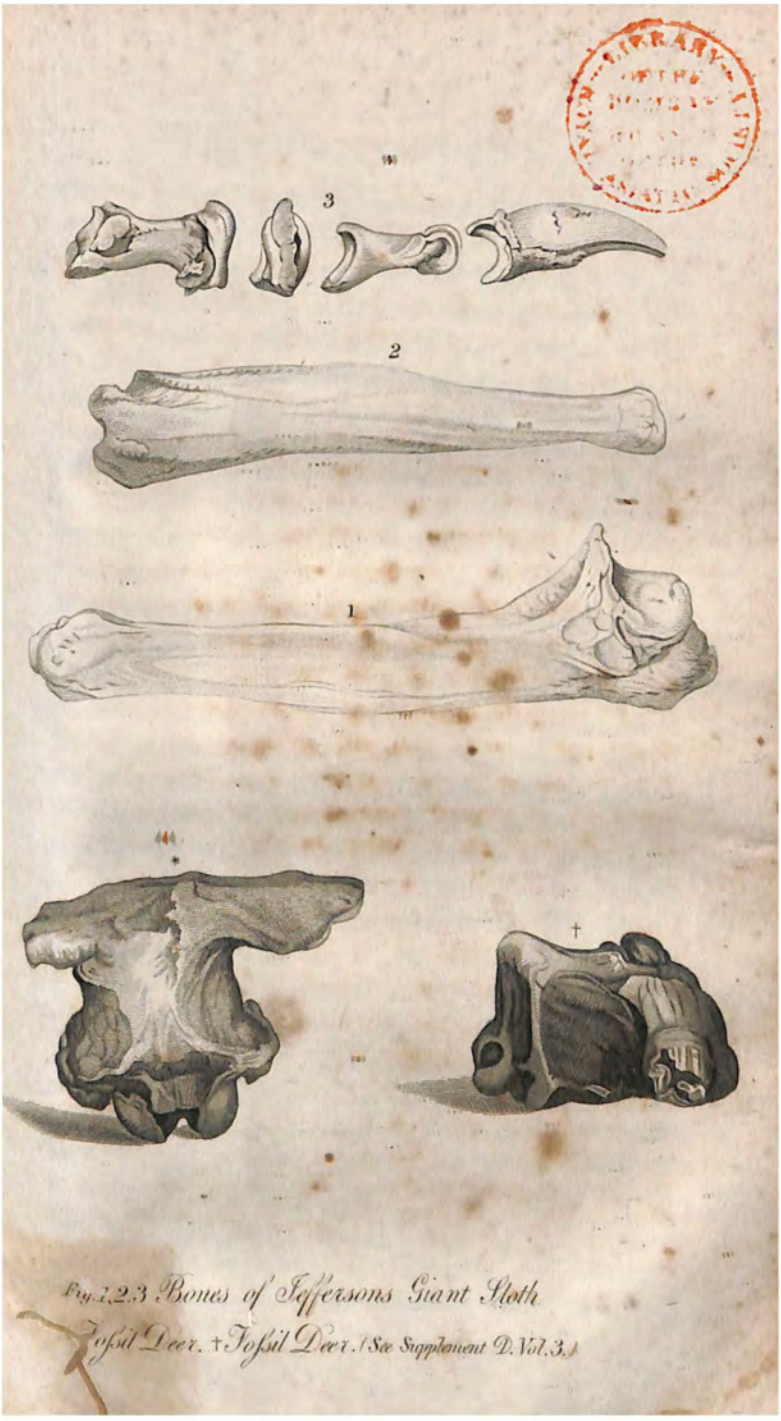

Fig. 1,2,3 Bones of Jeffersons Giant Sloth

* Fossil Deer. † Fossil Deer. (See Supplement D. Vol. 3.)

lics, which indubitably establish the fact, that at some very early period this country contained a second species of quadruped of gigantic size, resembling the sloths in structure and manners. The only fragments yet obtained of the skeleton of this extinct species were discovered in a saltpetre-cave, belonging to Mr. Frederic Cromer, in Green Briar county, Va. where they were found about three feet below the surface of the cave's floor. "The importance of the discovery (says the distinguished author first above cited) was not known to those who made it, yet it excited conversation in the neighbourhood, and led persons of vague curiosity to seek and take away the bones. It was fortunate for science that one of its zealous and well informed friends, Col. JOHN STEWART, of that neighbourhood, heard of the discovery, and, sensible from the description that they were not of any animal known, took measures without delay for saving those which still remained. He was kind enough to inform me of the incident, and to forward me the bones from time to time as they were recovered. To these I was enabled accidentally to add some others, by the kindness of Mr. Hopkins, of New York, who had visited the cave."

The bones thus obtained consisted of a fragment of an arm or thigh-bone, a complete radius, and an ulna, which was broken in two, but not otherwise injured; three of the phalanges on which the claws were sustained, and several bones belonging to the fore or hind feet.

In the absence of every opportunity for making a proper comparison of these bones, we are not sur-

prised that JEFFERSON should, in the first instance, have compared them with the skeleton of the lion, as described by DAUBENTON; or that he should come to the conclusion that this unknown species was "*more* than three times as large as the lion; that he stood pre-eminently at the head of the column of clawed animals, as the mammoth stood at that of the elephant, rhinoceros and hippopotamus; and that he may have been as formidable an antagonist to the mammoth as the lion to the elephant." In a post-script to the same memoir, the author makes some observations on a very imperfect account of the *megatherium*, which prove that nothing but the want of proper materials for comparison prevented him from referring his *megalonyx*, or great claw, to its proper place.*

The late professor WISTAR, so justly distinguished for his zeal in the cause of science, drew correct, though not altogether positive conclusions in relation to these bones. After giving a detailed description

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* "P. S. March 10, 1797. After the preceding communication was ready to be delivered in to the society, in a periodical publication from London, (Monthly Magazine, Sept. 1796) I met with an account and drawing of the skeleton of an animal dug up near the river La Plata, in Paraguay, and now mounted in the cabinet of Natural History of Madrid. The figure is not so done as to be relied on, and the account is only an abstract from that of Cuvier and Roumé. This skeleton is also of the clawed kind, and having only four teeth on each side, above and below, all grinders is, on this account, classed in the family of the unguiculated quadrupeds destitute of cutting teeth, and receives the new denomination of *megatherium*: having nothing

of them, he makes the following observations:—"from the shortness of the metacarpal bone, and the form and arrangement of the other bones of the paw, and also from the form of the solitary metatarsal bone, it seems probable that the animal did not walk on the toes; *it is also evident that the last phalanx was not* retracted. The particular form of the second bone, and its connexion with the first and third, must have produced a peculiar species of flexion in the toes, which, combined with the greater flexion of the last phalanx upon the second, must

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of our animal but the leg and foot-bones, we have few points of comparison between them. They resemble in their stature, that being twelve feet nine inches long, and six feet four and a-half inches high, and ours by computation, five feet 1.75 inches high: they are alike in the colossal thickness of the thigh and leg-bones also. They resemble, too, in having claws: but those of the figure appear very small, and the verbal description does not satisfy us, whether the claw-bone, or only its horny cover, be large. They agree too in the circumstance of the two bones of the forearm being distinct and moveable on each other; which, however, is believed to be so usual as to form no mark of distinction. They differ in the following circumstances, if our relations are to be trusted:—The megatherium is not of the cat-form, as are the lion, tiger and panther, but is said to have striking relations in all parts of its body with the bradypus, darypus, pangolin, &c. According to analogy, then, it had not the phosphoric eye nor leonine roar. But to solve satisfactorily the question of identity, the discovery of fore teeth, or a jaw-bone, showing it [the megalonyx, or Jefferson's animal, both jaws of the megatherium having been figured] had, or had not such teeth, must be waited for and hoped with patience. It may be better in the mean time to keep up the difference of name."—*Phil. Soc. Trans.* p. 259.

have enabled the animal to turn the claws under the soles of the feet; from this view of the subject there seems to be some analogy between the foot of this animal and that of the Bradypus [Sloth]—having no specimens of that animal, I derive this conclusion from the description of its feet given by M. DAUBENTON."*

CUVIER was the first to establish, from sufficient data, the true place and character of this animal; from all his comparisons and investigations he lays down the following positions:

"1st, That the animals which furnish these fossil bones were not carnivorous;—2d, that they had, in large, all the forms and all the details of organization that the sloths exhibit in small, and that the details of these organizations must have been similar;—3d, that if they are separated from them in some unimportant particulars, it is only in approaching the nearest allied genus, that of the ant-eaters;—4th, that the approximation of these fossil animals to the sloths, and their classification in the *Edentous* family, in general, are not arbitrary, nor founded on artificial characters, but that they are the necessary result of the intimate identity in the nature of both."

The great size of this animal precludes the idea of its living upon trees, exactly in the manner of living sloths, but every thing discovered of its structure forbids us from thinking that its mode of life was widely different. A sloth of the size of an ox, would find few trees whose branches would be capable of

* Am. Phil. Trans. vol. iv. 530.

sustaining so great a weight; but in not climbing it would not differ more from the sloth than species of other genera do from each other.

We subjoin the measurements of these bones, and deem it unnecessary to describe them individually with minuteness. The figures given in the plate will convey a better idea of them than we possibly could by words.

	Inches.
Length of the ulna, - - - - -	20.1
Breadth to tip of its coronoid process, -	9.55
——— in the middle of the bone, - -	3.8
Length of the radius, - - -	17.75
——— at its head, - - - -	2.65
Breadth near the carpal extremity, -	4.5*
Length of the metacarpal bone, *a* - -	3.5
——— of the first phalanx, *b* -	1.25
——— of the second, *c* - -	2.25
——— of the third, *d* - -	7.

* Jefferson, in Philos. Trans. ut supra.

CHAPTER XV.

Order V.—Belluæ; L. *Dense Skinned Animals;* C.

The animals pertaining to this order cannot flex their digits, nor lay hold of objects, their feet being exclusively destined to support their weight: they are, therefore, not provided with clavicles; (collar-bones.) The fore arm always remains in a state of pronation; (with the palm against the earth.) They feed on vegetable matters, and do not ruminate; the stomach is membranous and simple, or merely divided by membranous bands.*

Family I.—Proboscidia; *Having a Trunk and Tusks.*

In the skeleton all the feet are distinctly five-toed, but in the living animal these are entirely concealed by thick and callous integument, which shows no external mark of their existence, except by the nails, which border this sort of hoof. There are no true incisive nor canine teeth in the upper jaw, but

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* The term used by Linné as the name of this order, is applicable to every wild beast of great size, strength, &c. Cuvier calls the order *Pachydermata*, the translation of which we use as a trivial name for the order, instead of a

two great tusks, growing from the intermaxillary bones, project externally and increase to a vast size. The magnitude of the sockets required for these tusks renders the upper jaw so high, and shortens the bones of the nose so much, that in the skeleton the nostrils are found near the upper part of the face; but in the living animal they are prolonged into a cylindrical trunk, composed of thousands of small muscles, variously interlaced, moveable in every direction, endowed with an exquisite sensibility, and terminating by an appendix somewhat in form of a finger. The skull has large vacant spaces between its plates, by which a greater extent is given for the origin of muscles, without unnecessary increase of weight to the head. The lower jaw has no incisive teeth; the intestines are very large; the cœcum enormous; the teats, two in number, are placed upon the chest. The young of the elephant, the only living animal of this family, sucks with the mouth and not with the trunk.*

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better, which cannot well be obtained, however much it is to be desired. Other animals, meriting either of the names used for the order, may be found, yet by no means corresponding with the definition above given. The *name*, therefore, in this case, as in numerous others, must be associated with the characters of the order, as laid down, without reference to its own etymological signification.

* Cuvier Régne Animal, i. 228.

Genus II.—Mastodon; *Mastodon;* C.

GENERIC CHARACTERS.

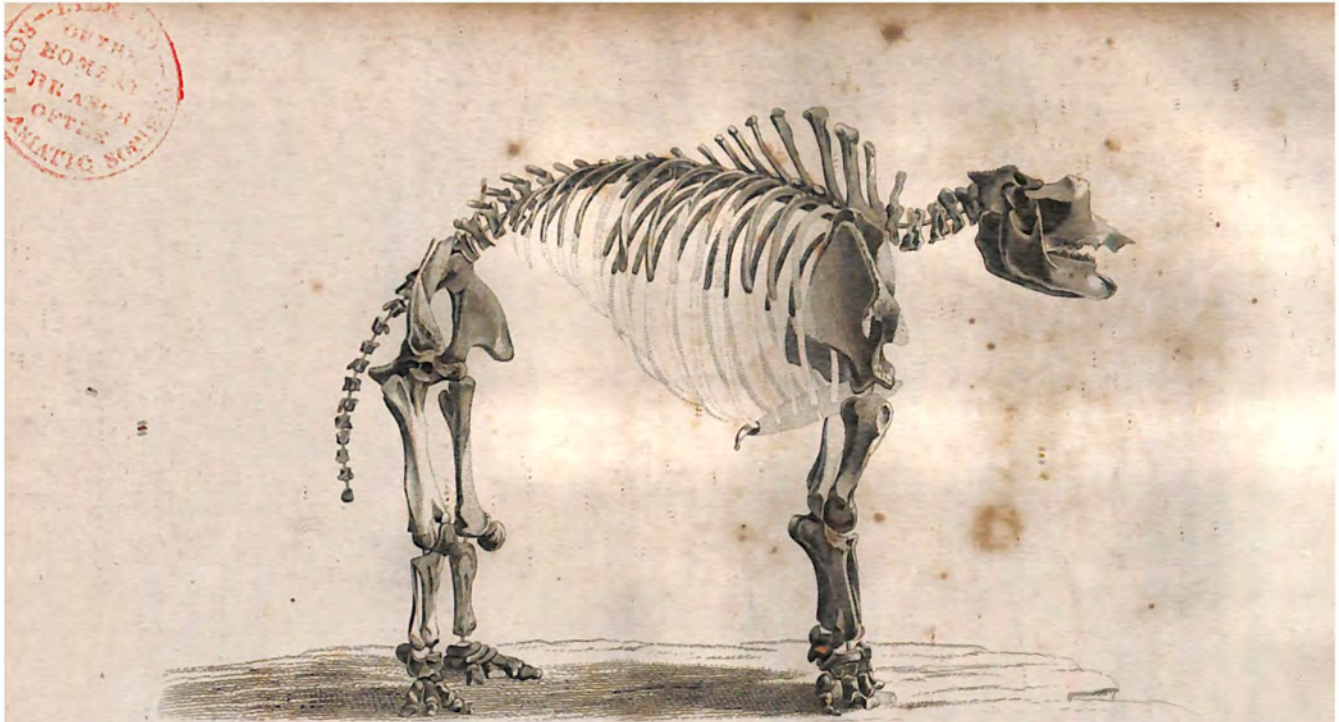
The form of the superior part of the head still remains unknown, the whole mass above the level of the zygomatic process being destroyed. The intermaxillary bones are long, and have at their extremities the openings of very large sockets for the tusks, which are very large and long. The lower jaw, ending in a point at the symphisis, is hollowed into a sort of canal; the neck is very short, the limbs long and five toed, and the ribs nineteen in number. The tail was moderately long.

Dental System.

10 Teeth:	6 Upper	2 Incisive, (in form of tusks)	
		4 Molar.	
	4 Lower	4 Molar.	

The incisive teeth, very analogous to those of the elephant, are formed of ivory, which, when transversely cut, exhibits curvilinear lozenges, produced by the intersection of lines of a harder bony substance. The molars have rectangular crowns, somewhat straighter in the hind than in the fore teeth. They are composed of but two substances, the external being a thick enamel, and the internal bony matter, without cement or cortical substance, each tooth weighing about twelve pounds.

The crowns of these teeth are divided by very open trenches into transverse eminences, and each eminence is itself divided into two great, obtuse, ir-



Great Mastodon

regularly formed points, constituting slightly rounded quadrangular pyramids. When the crown is not worn it is studded with knobs, or points disposed in pairs, from six to ten in number.

Species I.—*The Gigantic Mastodon.*

Mastodon Giganteum; C.

Animal Incognitum: Remb. Peale, Account of the Skeleton of the Mammoth, 4to. 2d. ed. Lond. 1806.
Mastodon Giganteum: C. An. du Mus. Recherches Sur less Oss. Foss. ed 2, i. p. 206.
Mastodon Giganteum: Account of the Discovery of the Skeleton of the Mastodon Giganteum. Extracted from the Report made to the Lyceum of Natural History, by Messrs. Dekay, Van Rensselaer, and Cooper. Annals Lyceum of Nat. Hist. of N. York, v. i. p. 143.

[*Improperly called Mammoth.*]

In various parts of North America single bones of extraordinary size had been occasionally disinterred, without exciting more than temporary curiosity, or leading to any thing better than wild and unsatisfactory speculation. Some persons regarded them as the relics of a gigantic race of men, of whose existence no other traces remained; others, who appeared willing to surpass all absurdity, suggested that they might have belonged to the *angels* who were expelled their celestial habitations; while a third, and more rational party, concluded that they were the bones of an animal still in existence, or belonged to a larger variety of the well known elephant species.—The inquiry generally ceased when the novelty of their discovery passed away; those by whom they were found were in pursuit of other objects, and very

frequently neglected to preserve the fragments already obtained. But when situations were explored where they were procured in greater abundance, and the curiosity of European naturalists was awakened, these relics were eagerly sought for, until nearly a whole skeleton was obtained, the fact satisfactorily established, that these bones belonged to a peculiar race never before known, and, what was still more surprising, that the whole race was utterly extinct.

We find, as early as the year 1712, a letter from Dr. Mather to Dr. Woodward, published in the Philosophical Transactions, announcing that some bones and teeth of a monstrous size had been discovered at Albany, in New York.

In the year 1739, some savages belonging to the company of a French officer named LONGUEIL, who was descending the Ohio to the Mississipi, found, at a short distance from the river, at the edge of a marsh, some bones, grinders, and tusks, belonging to this unknown animal. The year after LONGUEIL took to Paris a thigh-bone, the extremity of a tusk, and three grinders, which are still preserved there. Since that time these bones have been discovered in many places; though, in consequence of the notice first attracted by the specimens found on the Ohio river, the name of Animal of the Ohio had been bestowed on this creature, yet this name, and that of *Mammoth*, have at length been entirely superseded by that proposed by CUVIER.

About the year 1740, vast numbers of these bones, which had been washed up by the current of the Ohio, or were purposely digged for, were found in Kentucky. The eagerness to procure them, and the

haste with which they were sent to Europe, retarded the knowledge of the true character of the animal—as it became impossible to procure or recognize the bones belonging to different skeletons, or to determine their exact numbers and proportions. Over France, England and Germany, they were in this manner scattered in confusion; and we need not be surprised that naturalists were long in forming just ideas of the character of the animal, or indulged so much the disposition to maintain theories established on such slight foundations.

The force of prejudice may be clearly seen in the perseverance with which BUFFON, and some other scientific men, maintained that these bones belonged to a variety of the elephant race; for if he admitted that they did not belong to that kind, he must have acknowledged that they were the bones of an extinct genus, which was an idea not then proposed, but has since most amply been proved true, and a vast number of extinct species discovered.

In consequence of some large bones having been previously found in Siberia, that were really *elephantine*, the idea readily became prevalent that the great bones of the Ohio and other parts of North America were similar. Hence the name *mammoth* (said to be a corruption of the Hebrew word Behemoth) was applied to the American animal, and continued to be generally used, until the extreme difference of its structure induced naturalists to consider it properly, raise it to the rank of a distinct genus, and bestow on it a name expressive of its most striking characteristic, the form of the teeth.

It was not until the year 1801, a period of eighty-

nine years from the first discovery of the bones at Albany, that any hopes were entertained of finding an entire skeleton of this wonderful and interesting animal.

In the year 1824 a considerable part of a skeleton was raised in New Jersey by some scientific gentlemen of New York; but they have not discovered any thing more than was previously made known by the exertions of Messrs. PEALE; the head, which is the only important part wanting, was too much decomposed to enable them to form any idea of its figure.

The emotions experienced, when for the first time we behold the giant relics of this great animal, are those of unmingled awe. We cannot avoid reflecting on the time when this huge frame was clothed with its peculiar integuments, and moved by appropriate muscles; when the mighty heart dashed forth its torrents of blood through vessels of enormous caliber, and the mastodon strode along in supreme dominion over every other tenant of the wilderness. However we examine what is left to us, we cannot help feeling that this animal must have been endowed with a strength exceeding that of other quadrupeds, as much as it exceeded them in size; and, looking at its ponderous jaws, armed with teeth peculiarly formed for the most effectual crushing of the firmest substances, we are assured that its life could only be supported by the destruction of vast quantities of food.

Enormous as were these creatures during life, and endowed with faculties proportioned to the bulk of their frames, the whole race has been extinct for

ages. No tradition nor human record of their existence has been saved, and but for the accidental preservation of a comparatively few bones, we should never have dreamed that a creature of such vast size and strength once existed,—nor could we have believed that such a race had been extinguished forever. Such, however, is the fact—ages after ages have rolled away—empires and nations have arisen, flourished, and sunk into irretrievable oblivion, while the bones of the mastodon, which perished long before the periods of their origin, have been discovered, scarcely changed in colour, and exhibiting all the marks of perfection and durability.

That a race of animals so large, and consisting of so many species, should become entirely and universally extinct, is a circumstance of high interest;—for it is not with the mastodon as with the elephant, which still continues to be a living genus, although many of its species have become extinct:—the entire race of the mastodon has been utterly destroyed, leaving nothing but the "mighty wreck" of their skeletons, to testify that they once were among the living occupants of this land. Into the probable causes of this extinction we shall hereafter make a fuller inquiry.

The situations whence these bones have been most commonly obtained, appear to have greatly contributed to their preservation. They have generally been dug from beneath a considerable mass of mud, or marle, where they have long soaked in fluids charged with saline and other impregnations. Thus they have been equally protected against the effects of detrition and vicissitudes of weather, and most

of the bones found are in every respect perfect, with the exception of an unimportant change in colour. This circumstance is almost universally observed of the bones contained in the different cabinets of this country; when scraped or cut they exhale an odour remarkably similar to that produced by the same treatment of a recent bone.

There are several circumstances leading us almost to despair of ever procuring the upper part of the skull, which, on account of its comparative thinness and weakness, as well as the fact of its being always found much nearer the surface, must be among the first parts to decay, and be irrecoverably lost. No specimen has yet been obtained more perfect than the one in the Philadelphia Museum, and this has no part of the skull above the level of the zygomatic arches. In this, as in all the individuals discovered, the top of the head was so far decayed and destroyed as to prevent the least idea being formed as to its figure or elevation.

Enough of the head has fortunately been preserved to make us fully acquainted with the dentition of this great animal, and enable us to decide on the general nature of its food and habits of living. Without the aid derived from this source we should still be in doubt, and have nothing to guide us to a satisfactory conclusion, although the analogy in size and general configuration might have served to produce the inference, that the animal was, in other respects, most nearly allied to the elephant, rhinoceros, or hippopotamus.

The circumstances attending the exhumation of the most perfect skeleton ever obtained of this great

animal, are deeply interesting to every votary of natural science; and the author believes that he cannot more effectually minister to the gratification of his readers, than by introducing in this place the account written by his father-in-law, an eye-witness and enthusiatic co-operator in that enterprise, which has secured to the scientific world one of its most interesting and instructive possessions. In addition to the authenticity of this record, (prepared almost on the spot, by so competent a hand) it is drawn up with a raciness and vigour which imparts to the reader's mind an excitement, not to be awakened by any cause, short of truth, breathed forth with the vivid energy of enthusiasm.

Narrative of the discovery and exhumation of the skeleton of the Mastodon; by REMBRANDT PEALE.

In the spring of 1801, receiving information from a scientific correspondent in the state of New York, that in the autumn of 1799 many bones of the MAMMOTH had been found in digging a marle-pit in the vicinity of Newburgh, which is situated on the river Hudson, sixty-seven miles from the city of New York, my father, Charles Wilson Peale, immediately proceeded to the spot, and through the politeness of Dr. Graham, whose residence on the banks of the Wall-kill enabled him to be present when most of the bones were dug up, received every information with respect to what had been done, and the most probable means of future success. The bones that had been found were then in the possession of the farmer who discovered them, heaped on the floor of

his garret or granary, where they were occasionally visited by the curious. These my father was fortunate to make a purchase of,* together with the right of digging for the remainder, and, immediately packing them up, sent them on to Philadelphia. But as the farmer's fields were then in grain, the enterprise of further investigation was postponed for a short time.

The whole of this part of the country abounding with morasses, solid enough for cattle to walk over, containing peat, or turf and shell-marle, it is the custom of the farmers to assist each other, in order to obtain a quantity of the marle for manure. Pits are dug generally twelve feet long and five feet wide at the top, lessening to three feet at the bottom.—The peat or turf is thrown on lands not immediately in use; and the marle, after mellowing through the winter, is in the spring scattered over the cultivated fields—the most luxuriant crops are the consequence. It was in digging one of these, on the farm of John Masten, that one of the men, thrusting his spade deeper than usual, struck what he supposed to be a

* They consisted of all the neck, most of the vertebræ of the back, and some of the tail; most of the ribs, in greater part broken; both scapulæ; both humeri, with the radii and ulnæ; one femur; a tibia of one leg, and a fibula of the other; some large fragments of the head; many of the fore and hind feet bones; the pelvis, somewhat broken; and a large fragment, five feet long, of one tusk, about mid-way. He therefore was in want of some of the back and tail bones, some of the ribs, the under jaw, one whole tusk and part of the other, the breast bone, one thigh, and a tibia and fibula, and many of the feet bones.

log of wood, but on cutting it to ascertain the kind, to his astonishment, he found it was a bone: it was quickly cleared from the surrounding earth, and proved to be that of the thigh, three feet nine inches in length, and eighteen inches in circumference, in the smallest part. The search was continued, and the same evening several other bones were discovered. The fame of it soon spread through the neighbourhood, and excited a general interest in the pursuit: all were eager, at the expense of some exertions, to gratify their curiosity in seeing the ruins of an animal so gigantic, of whose bones very few among them had ever heard, and over which they had so often unconsciously trod. For the two succeeding days upwards of an hundred men were actively engaged, encouraged by several gentleman, chiefly physicians, of the neighbourhood, and success the most sanguine attended their labours: but, unfortunately, the habits of the men requiring the use of spirits, it was afforded them in too great profusion, and they quickly became so impatient and unruly, that they had nearly destroyed the skeleton; and, in one or two instances, using oxen and chains to drag them from the clay and marle, the head, hips, and tusks were much broken; some parts being drawn out, and others left behind. So great a quantity of water, from copious springs, bursting from the bottom, rose upon the men, that it required several score of hands to lade it out, with all the milk-pails, buckets and bowls, they could collect in the neighbourhood. All their ingenuity was exerted to conquer difficulties that every hour increased upon their hands; they even made and sunk a large coffer-dam, and within it found

many valuable small bones. The fourth day so much water had risen in the pit, that they had not courage to attack it again. In this state we found it in 1801.

It was a curious circumstance attending the purchase of these bones, that the sum which was paid for them was little more than one-third of what had been offered to the farmer for them by another, and refused, not long before. This anecdote may not be uninteresting to the moralist, and I shall explain it. The farmer, of German extraction—and like many others in America, speaking the language of his fathers better than that of his country—was born on his farm; he was brought up to it as a business, and it continued to be his pleasure in old age; not because it was likely to free him from labour, but because profit, and the prospect of profit, cheered him in it, until the end was forgotten in the means.—Intent upon manuring his lands to increase its production, (always laudable) he felt no interest in the fossil-shells contained in his morass; and had it not been for the men who dug with him, and those whose casual attention was arrested, or who were drawn by report to the spot, for him the bones might have rotted in the hole in which he discovered them; this he confessed to me would have been his conduct, certain that after the surprise of the moment they were good for nothing but to rot as manure. But the learned physician, the reverend divine, to whom he had been accustomed to look upwards, gave importance to the objects which excited the vulgar stare of his more inquisitive neighbours: he therefore joined his exertions to theirs, to recover as many of the bones as possible. With him, hope was every thing;

with the men, curiosity did much, but rum did more, and some little was owing to certain prospects which they had of sharing in the future possible profit. It is possible he might have encouraged this idea; his fear of it, however, seems to have given him some uneasiness; for when he was offered a small sum for the bones, it appeared too little to divide: and when a larger sum, he fain would have engrossed the whole of it, or persuade himself that the real value might be something greater. Ignorant of what had been offered him, my father's application was in a critical moment, and the farmer accepted his price, on condition that he should receive a new gun for his son, and new gowns for his wife and daughters, with some other articles of the same class. The farmer was glad they were out of his granary, and that they were in a few days to be two hundred miles distant; and my father was no less pleased with the consciousness, and on which every one complimented him, that they were in the hands of one who would spare no exertions to make the best use of them. The neighbours, who had assisted the farmer in this discovery, envious of his good fortune, sued him for a share in the profit; but they gained nothing more than a dividend of the costs; it appearing that they had been satisfied with the gratification of their curiosity, and the quality and quantity of the rum; no one could prove that he had given them reason to hope for a share in the price of any thing his land might happen to produce.

Not willing to lose the advantage of an uncommonly dry season, when the springs in the morass were low, we proceeded on the arduous enterprize.

In New York every article was provided which might be necessary in surmounting expected difficulties; such as a pump, ropes, pullies, augers, &c.; boards and plank were provided in the neighbourhood, and timber was in sufficient plenty on the spot.

Confident that nothing could be done without having a perfect command of the water, the first idea was to drain it by a ditch; but the necessary distance of perhaps half a mile, presented a length of labour that appeared immense. It was therefore resolved to throw the water into a natural bason, about sixty feet distant, the upper edge of which was about ten feet above the level of the water. An ingenious millwright constructed the machinery, and, after a week of close labour, completed a large scaffolding and a wheel twenty feet diameter, wide enough for three or four men to walk a-breast in: a rope round this turned a small spindle, which worked a chain of buckets regulated by a floating cylinder; the water, thus raised, was emptied into a trough, which conveyed it to the bason; a ship's pump assisted, and, towards the latter part of the operation a pair of half barrels, in removing the mud. This machine worked so powerfully, that in the second day the water was lowered so much as to enable them to dig, and in a few hours they were rewarded with several small bones.

The road which passed through this farm was a highway, and the attention of every traveller was arrested by the coaches, wagons, chaises, and horses, which animated the road, or were collected at the entrance of the field: rich and poor, men, women and children, all flocked to see the operation; and a swamp

always noted as the solitary abode of snakes and frogs, became the active scene of curiosity and bustle: most of the spectators were astonished at the purpose which could prompt such vigorous and expensive exertions, in a manner so unprecedented, and so foreign to the pursuits for which they were noted.—But the amusement was not wholly on their side; and the variety of company not only amused us, but tended to encourage the workmen, each of whom, before so many spectators, was ambitious of signalizing himself by the number of his discoveries.

For several weeks no exertions were spared, and the most unremitting were required to insure success; bank after bank fell in; the increase of water was a constant impediment, the extreme coldness of which benumbed the workmen. Each day required some new expedient, and the carpenter was always making additions to the machinery; every day bones and pieces of bones were found between six and seven feet deep, but none of the most important ones. But the greatest obstacle to the search was occasioned by the shell marle which formed the lower stratum; this, rendered thin by the springs at the bottom, was, by the weight of the whole morass, always pressed upwards on the workmen to a certain height, which, without an incalculable expense, it was impossible to prevent. Twenty-five hands at high wages were almost constantly employed at work which was so uncomfortable and severe, that nothing but their anxiety to see the head, and particularly the under jaw, could have kept up their resolution. The patience of employer and workmen was at length exhausted, and the work relinquished without ob-

taining those interesting parts, the want of which rendered it impossible to form a complete skeleton.

It would not have been a very difficult matter to put these bones together, and they would have presented the general appearance of the skeleton; but the under jaw was broken to pieces in the first attempt to get out the bones, and nothing but the teeth and a few fragments of it were now found; the tail was mostly wanting, and some toe-bones. It was, therefore, a desirable object not only to procure some knowledge of these deficient parts, but if possible to find some other skeleton in such order as to see the position, and correctly to ascertain the number of the bones. In the course of eighteen years there had been found within twelve miles of this spot, a bone or two in several different places; concerning these we made particular inquiries, but found that most of the morasses had been since drained, and consequently either the bones had been exposed to a certain decay; or else so deep, that a fortune might have been spent in the fruitless pursuit. But through the polite attention of *Dr. Galatan*, we were induced to examine a small morass, eleven miles distant from the former, belonging to Capt. J. Barber, where, eight years before, four ribs had been found in digging a pit. From the description which was given of their position, and the appearance of the morass, we began our operations with all the vigour a certainty of success could inspire. Nearly a week was consumed in making a ditch, by which all the water was carried off, except what a hand-pump could occasionally empty; the digging, therefore, was less difficult than that at Maston's, though still tedious

and unpleasant; particularly as the sun, unclouded as it had been for seven weeks, poured its scorching rays on the morass, so circumscribed by trees, that the western breeze afforded no refreshment; yet nothing could exceed the ardour of the men, particularly of one, a gigantic and athletic negro, who exulted in choosing the most laborious tasks, although he seemed melting with the heat. Almost an entire set of ribs were found, lying nearly together, and very entire; but as none of the back bones were found near them (a sufficient proof of their having been scattered) our latitude for search was extended to very uncertain limits; therefore, after working about two weeks, and finding nothing belonging to the head but two rotten tusks, (part of one of them is with the skeleton here) three or four small grinders, a few vertebræ of the back and tail, a broken scapula, some toe-bones, and the ribs, found between four and seven feet deep—a reluctant terminating pause ensued.

These bones were kept distinct from those found at Maston's, as it would not be proper to incorporate into one skeleton any other than the bones belonging to it; and nothing more was intended than to collate the corresponding parts. These bones were chiefly valuable as specimens of the individual parts; but no bones were found among them which were deficient in the former collection, and therefore our chief object was defeated. To have failed in so small a morass was rather discouraging to the idea of making another attempt; and yet the smallness of the morass was, perhaps, the cause of our failure, as it was extremely probable the bones we could not

find were long since decayed, from being situated on the rising slope at no considerable depth, unprotected by the shell-marle, which lay only in the lower part of the bason forming the morass. When every exertion was given over, we could not but look at the surrounding unexplored parts with some concern, uncertain how near we might have been to the discovery of all that we wanted, and regretting the probability that, in consequence of the drain we had made, a few years would wholly destroy the venerable objects of our research.

Almost in despair at our failure in the last place, where so much was expected, it was with very little spirit we mounted our horses, on another inquiry. Crossing the Walkill at the falls, we ascended over a double swelling hill into a rudely cultivated country, about twenty miles west from the Hudson, where, in a thinly settled neighbourhood, lived the honest farmer Peter Millspaw, who, three years before, had discovered several bones: from his log-hut he accompanied us to the morass.—It was impossible to resist the solemnity of the approach to this venerable spot, which was surrounded by a fence of safety to the cattle without. Here we fastened our horses, and followed our guide into the centre of the morass, or rather marshy forest, where every step was taken on rotten timber and the spreading roots of tall trees, the luxuriant growth of a few years, half of which were tottering over our heads. Breathless silence had here taken her reign amid unhealthy fogs, and nothing was heard but the fearful crash of some mouldering branch or towering beach. It was almost a dead level, and the holes dug for the purpose

of obtaining manure, out of which a few bones had been taken six or seven years before, were full of water, and connected with others containing a vast quantity; so that to empty one was to empty them all; yet a last effort might be crowned with success; and, since so many difficulties *had been* conquered, it was resolved to embrace the only opportunity that now offered for any farther discovery. Machinery was accordingly erected, pumps and buckets were employed, and a long course of troughs conducted the water among the distant roots to a fall of a few inches, by which the men were enabled, unmolested, unless by the caving in of the banks, to dig on every side from the spot where the first discovery of the bones had been made.

Here alternate success and disappointment amused and fatigued us for a long while; until, with empty pockets, low spirits, and languid workmen, we were about to quit the morass with but a small collection, though in good preservation, of ribs, toe and leg-bones, &c. In the meanwhile, to leave no means untried, the ground was searched in various directions with long-pointed rods and cross-handles: after some practice we were able to distinguish by feeling, whatever substances we touched harder than the soil; and by this means, in a very unexpected direction, though not more than twenty feet from the first bones that were discovered, struck upon a large collection of bones, which were dug to and taken up, with every possible care. They proved to be a humerus, or large bone of the right leg, with the radius and ulna of the left, the right scapula, the atlas,

several toe-bones, and the great object of our pursuit, a complete UNDER JAW!

After such a variety of labour and length of fruitless expectation, this success was extremely grateful to all parties, and the unconscious woods echoed with repeated huzzas, which could not have been more animated if every tree had participated in the joy. "Gracious God, what a jaw! how many animals have been crushed by it!" was the exclamation of all; a fresh supply of grog went round, and the hearty fellows, covered with mud, continued the search with increasing vigour. The upper part of the head was found twelve feet distant, but so extremely rotten that we could only preserve the teeth and a few fragments. In its form it exactly resembled the head found at Masten's; but, as that was much injured by rough usage, this, from its small depth beneath the surface, had the cranium so rotted away as only to show the form around the teeth, and thence extending to the condyles of the neck; the rotten bone formed a black and greasy mould above that part which was still entire, yet so tender as to break to pieces on lifting it from its bed.

This collection was rendered still more complete by the addition of those formerly taken up, and presented to us by Drs. Graham and Post. They were a rib, the sternum, a femur, tibia and fibula, and a patella or knee-pan. One of the ribs had found its way into an obscure farm-house, ten miles distant, to which we fortunately traced it.

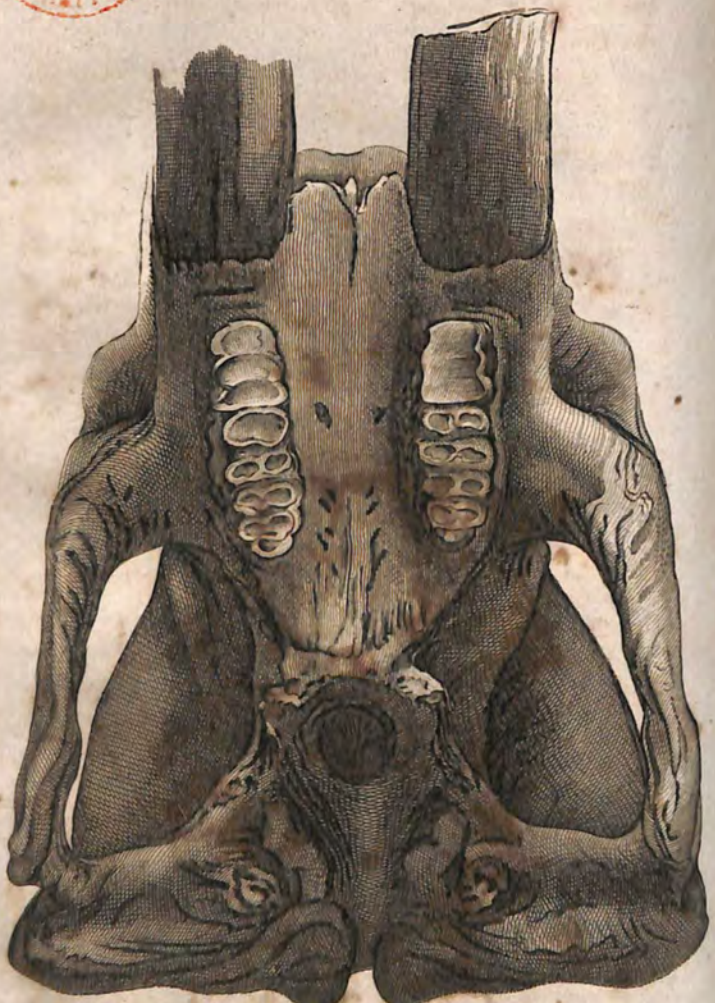
Thus terminated this strange and laborious campaign of three months, during which we were won-

derfully favoured, although vegetation suffered, by the driest season which had occurred within eight years. Our venerable relics were carefully packed up in distinct cases; and, loading two wagons with them, we bade adieu to the vallies and stupendous mountains of Shawangunk: so called by their former inhabitants, the Indians of the Lenape tribe. The three sets of bones were kept distinct: with the two collections which were most numerous it was intended to form two skeletons, by still keeping them separate, and filling up the deficiencies in each by artificial imitations from the other, and from counterparts in themselves. For instance, in order to complete the first skeleton, which was found at Masten's, the under jaw was to be modelled from this, which is the only intire one that has yet been discovered, although we have seen considerable fragments of at least ten different jaws: while, on the other hand, in the skeleton just discovered at Barber's, the upper jaw, which was found in the extreme of decay, was to be completed, so far as it goes, from the more solid fragment of the head belonging to the skeleton found at Masten's. Several feet-bones in this skeleton were to be made from that; and a few in that were to be made from this. In this the right humerus being real, the imitation for the left one could be made with the utmost certainty; and the radius and ulna of the left leg being real, those on the right side would follow, of course, &c. The collection of ribs in both cases was almost entire; therefore, having discovered from a correspondence between the number of vertebræ and ribs in both animals, that there were nineteen pair of the latter, it was neces-

sary in only four or five instances to supply the counterparts, by correct models from the real bones. In this manner the two skeletons were formed, and are in both instances composed of the appropriate bones of the animal, or exact imitations from the real bones in the same skeleton, or from those of the same proportion in the other. Nothing in either skeleton is imaginary; and what we have not unquestionable authority for, we leave deficient; which happens in only two instances, the *summit* of the head, and the *end* of the tail.

We now proceed to describe the parts composing the skeleton of the mastodon, and give in detail the measurements we have very carefully made on the excellent specimen in the Philadelphia Museum. To naturalists this will be the more acceptable as it has not heretofore been done throughout; and it will enable the general reader to form more definite conclusions relative to the animal, by furnishing positive data for the basis of an accurate comparison between the bones of this skeleton and those belonging to other large quadrupeds.

The Skull.—The upper parts of the skull are entirely lost, as already stated, down to the level of the anterior part of the zygomatic arch, except at the back of the skull, where the occipital bone rises above the level stated, and is eleven inches and a quarter high. The lower halves (or rather more) of the intermaxillary bones, and nearly the whole of the superior maxillary and cheek bones, are also preserved. The zygomatic arches are complete, and



the junction between the jugal process of the temporal and that of the malar bone is very strong, the process of the temporal bone forming little more than one-third of the arch.

The posterior part of the skull is the broadest portion, being thirty-two inches across. When the skull is placed on the ground inverted, and we look upon its inferior surface, (as exhibited in Mr. LESUEUR'S very accurate drawing) from the extreme points of this widest part of the head, the outlines of the sides of the skull speedily converge so as to run within the zygomatic arches, and continue to become narrower until traced to the posterior surface of the facial bases of the zygomatic arch, where the skull is narrowest. The outline formed by the external surface of the zygomatic arches, from the origin to the angles of the occipital bone, give the whole inferior and posterior surface of the skull a peculiarly square form. All the parts of the skull are exceedingly massive and hard, appearing to have undergone very little change.

The intermaxillary, or incisive bones, are nearly entire in their inferior portions, and on the left side, were most perfect, the part forming the sockets for the tusk measures thirteen inches and a-half in circumference, beginning opposite to the ante-orbitar foramen, and extending to a line continuous with the centre of the palate.

The maxillary, or upper jaw-bones, are entire, and the palate plate remarkably strong and compact in texture. The alveolar processes are situated very near the outer edge, and rise very slightly above the plane of the roof of the mouth, and diverge consi-

derably from the posterior to the anterior part of the range. Hence, at the back of the mouth the distance from the inside of the last molar to the same place on the opposite side, is six inches and one-eighth, while from the inside of the first molar to the correspondent tooth on the other side the space is eight inches. Immediately in front of the first molar, measuring from the external edge of its alveolar process to the same on the opposite side, the width of the palate plate is fifteen inches and four-eighths. Behind the last molar, and midway to the pterygoid processes of the sphenoid, the palate-bone is seven and a-half inches wide. The length of the pterygoid process, to the base of the skull, is seven inches.

The malar or cheek-bones, forming the prominences at the superior and external part of the face, are nearly entire. From the edge of the infra, or ante-orbitar foramen, to the zygomatic or temporal fossa, its width is five inches and an eighth; its height, measured within the fossa, is eight; its greatest breadth externally is six inches, and the narrowest portion of its zygomatic process three-quarters of an inch. Its length, from the foramen to the extremity of the zygomatic process, is seventeen inches and seven eighths.

The temporal bone is entire, except in its thin superior portion. The length of its zygomatic process is seven and a-half inches. The distance of the auditory foramen, from the cavity for the articulation of the lower jaw, is one inch. The cavity for the reception of the condyles of the lower jaw is one inch and seven-eighths, measured through the centre transversely.

The occipital bone is remarkably square on its posterior surface, which is thirty-two inches broad, and eleven inches and a-quarter high. How much higher the bone ascended cannot now be determined. The distance between the posterior extremities of the occipital condyles is two inches and one-sixteenth; the breadth of the condyle is three inches and one-eighth. The foramen magnum (for the exit of the spinal marrow) is two and a-half inches in diameter.

The first vertebræ of the neck, or atlas, receiving the condyles of the occipital bone, is eleven inches broad. Its length from the tip of one transverse process to the other is eighteen inches.

The most remarkable peculiarities of the mastodon skull are summed up by CUVIER in the following manner:*

1st. The molars of the mastodon *diverge* in front, while those of the living elephant converge, more or less, and those of the fossil elephant (the true mammoth of Siberia) are nearly parallel. The hog and hippopotamus are the only animals which, in this respect, resemble our animal.

2d. The bony palate extends far beyond the last tooth; among herbivorous animals the Ethiopian boar (*Phacochærus*) alone possesses this character.

3d. The pterygoid apophysis of the palate bones have a size unexampled among quadrupeds.

4th. The depression anterior to this apophysis has some relation with that of the hippopotamus, which, however, is straighter.

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* See R. PEALE's Disquisition, heretofore cited.

5th. There is no visible trace of the orbit at the anterior part of the zygomatic arch, whence the eye must have been much higher than in the elephant.

6th. The maxillary bones have much less vertical elevation than in the elephant, and resemble ordinary animals more strongly.

7th. The zygomatic arch, for the same reason, is much less elevated in front, which corresponds with the form of the lower jaw. The position of the ear depends on that of this arch.

8th. This position has much influence on the position of the occipital condyles, which are, in the elephant, considerably elevated above the level of the palate; in the mastodon they are nearly on the same level.

The Tusks.—As the bones of various other animals were discovered in the same place where the first tusks of this animal were found, some doubt was entertained of their belonging to the same skeleton, which contained the tuberculated molar teeth. Dr. W. Hunter stated in the Philosophical Transactions, his belief that they pertained to the same animal. But all doubt was dispersed by the discovery of the great skeleton obtained in New York by Messrs. Peale, which was entirely alone, or separated from the bones of all other quadrupeds.

The tusks of the mastodon bear a considerable resemblance to those of the elephant, but present some appearances different from those observed in the generality of tusks of that animal; though these are by no means greater than may be found in different individuals of that genus.

These tusks are rooted in the intermaxillary bones,

the sockets being eight inches in depth. The tusk belonging to the skeleton we are describing is ten feet seven inches long, measuring from the base to the tip, following the outside of the curvature; the point is not exactly in the same plane with the base, owing to the peculiar spiral twist of the anterior portion of the tusk. The direction of the tusk in leaving the socket is rather more oblique in front than in the elephant. The diameter of the tusks at base is seven inches and three-quarters; in the middle their substance is very similar to that of the elephant tusk, composed of an ivory, the grain of which is arranged in curvilinear lozenges. The external part of the tusk is hard, and differs considerably in appearance from common ivory; the internal is of the texture of ivory, but is of much softer consistence.

R. Peale dwells with much force on these circumstances, as well as on the roundness and peculiar curve of the mastodon tusk, in forming his conclusions relative to their position in the head, (which he believed to be with the convexity forwards, and the point turning downwards and backward) as well as in deciding on the mode of living of the animal. Cuvier has, however, satisfactorily shown that the differences are neither so uniform nor so remarkable as was believed, and that the difference in consistence of the ivory is accidental, or attributable to the circumstances under which these remains, during so great a lapse of time, were situated. As an immediate consequence of the great similarity existing between the skeletons and tusks of the elephant and mastodon, we form the inference that they were as *analogous* in their modes of living as in their conformation.

The tusks of our animal were placed with their convexity in front, and their points curving downwards and backwards, in the specimen mounted in the Philadelphia Museum. This position is certainly unnatural, as CUVIER has clearly shown, by reference to the length of limb of this animal, the impossibility of its using the tusks, thus arranged; and from the fact that the Siberian mammoth (elephant) has tusks equally curved, and their points unequivocally turned upwards.

The morse, which has tusks pointing downwards, (see vol. i. p. 351) is an animal possessing very short limbs, and destined to an aquatic life. A conclusion drawn from the tusks of this animal is inapplicable, since we must believe the mastodon (like the elephant) to have been a terrestrial animal. Nothing therefore can justify us in placing these tusks otherwise than in the elephant, unless we find a skull which has them actually implanted in a different manner.*

The Under Jaw of the mastodon is remarkable for its massiveness and solidity, and the form of it is peculiar to this animal. It is two feet ten inches long, and weighs sixty three and a-half pounds. The anterior part or chin is inclined so as to terminate conically, being marked by numerous rough prominences; where the two sides of the jaw unite in front, there is an intervening furrow or depression. The outline of the lower jaw is formed by three lines touching each other so as to form three different

* See Cuvier; Oss. Foss. tom. ii.

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angles; the first extends from the top of the condyloid process for twelve inches towards the angle of the jaw:—the second, commencing at this point and terminating in a protuberance, which is at the inferior and anterior part of the angle, and the third passing thence almost horizontally, terminates with the anterior extremity of the jaw.

The condyloid or articulating surfaces are five and a-half inches wide, and stand on very strong processes; the coronoid processes for the insertion of the temporal muscles are nearly on a level with the condyles, and are separated from them by a semilunar notch, six and a-quarter inches in width. The general figure of the lower jaw, at the posterior part extending forwards to the base of the coronoid process, bears considerable resemblance to the same parts in the human jaw.

The teeth in the lower jaw are arranged so as to be very nearly parallel to those in the upper jaw, and the two ranges are most widely separate at the fore part. They are not disposed parallel to the direction of the sides of the jaw, but diagonally, from the inner to the outer part. Thus these teeth do not meet the superior teeth fully crown to crown, but obliquely crossing each other, the lower teeth being worn most at the anterior part and on the outside, while the superior teeth are most worn on the inside and fore part of the mouth, as shown in the plate, figure 2.

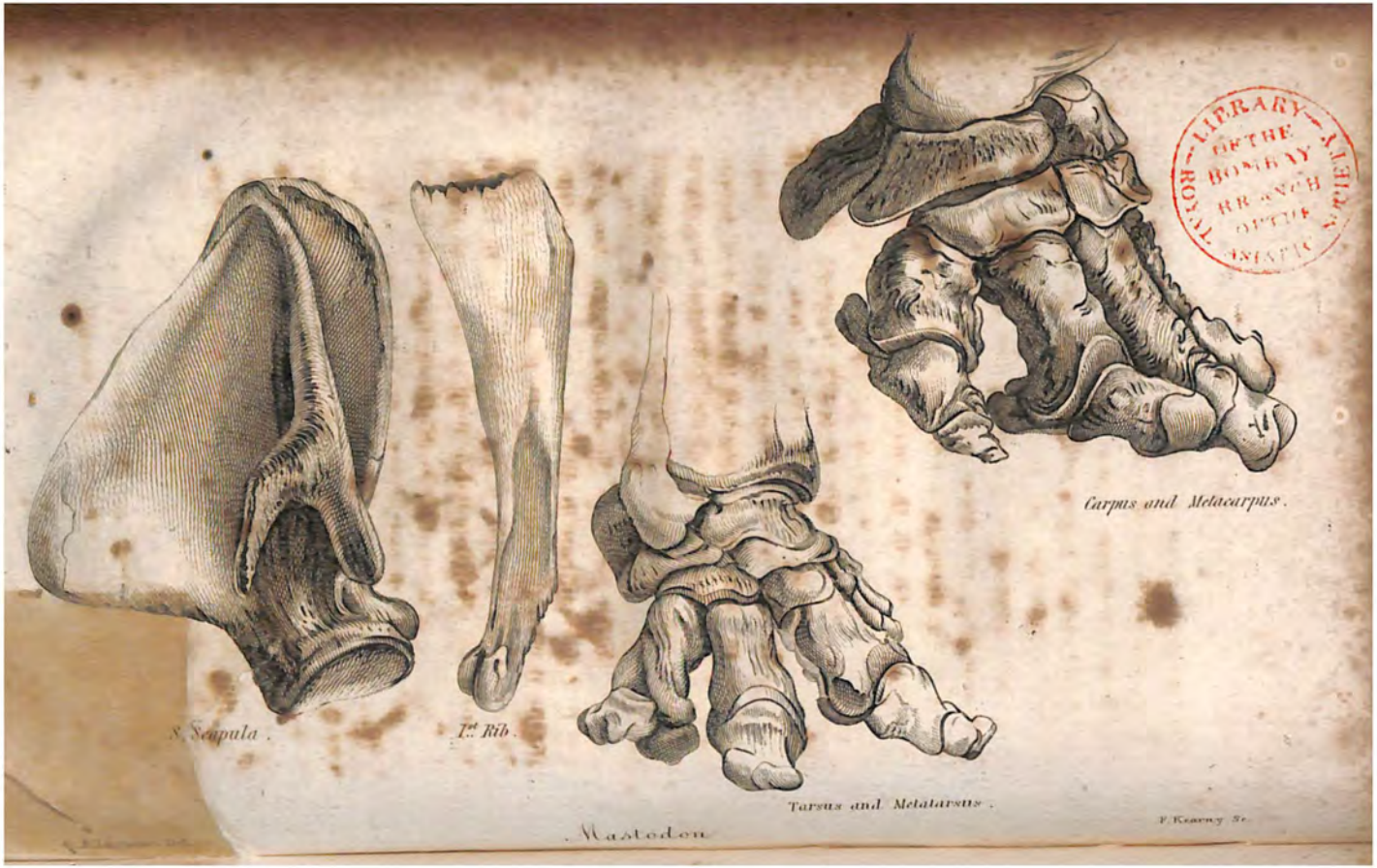
From the size of the head, the thickness and solidity of the teeth, and the enormous magnitude of the tusks, we can at once perceive that the neck of the animal must of necessity have been short, in order to sustain so great a weight. These circum-

stances, considered in connexion with the length of the limbs, presently to be described, clearly indicate that the mastodon, like the elephant, had a long and flexible trunk for the purpose of conveying its aliment to the mouth; the shortness of the neck, and the projection and curvature of the tusks, would equally have prevented the approach of the mouth to the ground.

Bones of the Trunk.—The bones of the neck are similar in character to those of the elephant, and thus far support the opinion drawn from the preceding circumstances. According to the observation of R. PEALE the spinous processes of the three last vertebræ of the neck are not so long in the elephant.

The spinous processes of the second, third and fourth dorsal vertebræ, are exceedingly long. The longest of them measures eighteen or twenty inches, the whole length of the vertebræ being twenty-seven. The spinous processes of the back then rapidly diminish to the twelfth, and become so small as scarcely to be remarked, thence to the sacrum. This conformation, as Mr. PEALE has well pointed out, differs remarkably from that of the elephant, in which the processes are more uniform in their length:—those over the shoulders being shorter, and those of the back and loins much longer; hence the form of the back in the elephant is more arched. There are seventeen cervical, nineteen dorsal, and three lumbar vertebræ. CUVIER remarks that the elephant has one more dorsal vertebra, and one more pair of ribs; but suggests that the corresponding parts in the mastodon have been destroyed.

The ribs are not similar to those of the elephant,



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small near the head, broad as they approach the cartilage, and bent sidewise in an undulating manner; but they are slender near the cartilage, and thick and strong towards the back. The difference is peculiarly observable in the first rib. The six first pairs are remarkably strong, when compared with the remainder, which are proportionally short. This, joined to the flatness of the pelvis, shows the belly to have been less in the mastodon than in the elephant.

Scapula, or Shoulder-blade.—This bone has the characters peculiar to that belonging to the elephant; particularly the recurrent process, which is only found in the elephant and some of the gnawing animals. The length of the whole bone is thirty-seven inches. The acromion process is very long and pointed.

Arm, Forearm, &c.—The arm-bone, or *humerus*, is very thick, and, in proportion, much thicker than the thigh-bone; this difference, in proportion, is much more remarkable than in the elephant.* In length the humerus is two feet ten inches; its greatest circumference is three feet two inches and a-half, and its smallest part measures one foot five inches around.

The *ulna* is proportionally as massive as the humerus, and the olecranon (process forming the point of the elbow) is strong and knobbed at the end, being eight inches and a-quarter in circumference at base. The ulna is two feet five inches and a-half long, while its circumference around the elbow is three feet eight inches.

* Peale, Hist. Disquis. 8vo. 56.

The *radius* is a comparatively small bone, two feet four inches long, and is placed in such a manner as to cross obliquely from the outside above to the inside below, forming thus a greater angle than if the bones were slender, in which case the crossing would be scarcely observable; perhaps it is more remarkable in the mammoth than in any other animal.* Its carpal articulating surface is four inches and five-eighths broad.

The bones of the *carpus*, in the skeleton belonging to the Philadelphia Museum, are seven in number; the forms of those in the first row generally agree with those of the elephant, as figured by CUVIER.† The external faces of those belonging to the second row appear to differ by being proportionally larger and squarer than in the elephant. The metacarpal bones are strong and massive; their surfaces for articulation with the digital phalanges are extensive, and indicate that the toes were capable of very considerable flexion. The metacarpal of the first digit, or thumb, is two inches and a-quarter in length, of the second digit three inches; of the third and fourth four inches and a-half; and of the fifth external, or smallest, three inches.

The Pelvis.—This part of the skeleton has sustained a considerable degree of injury. The iliac or haunch bones at their superior parts being in a great degree lost. Still the quantity of sound bone remaining is quite sufficient to show the general form and dimensions of this part of the animal. On

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* PEALE, Hist. Disquis. No. 56.

† Ossemens Fossiles, vol. ii. ed. 1

the left side the bone is uninjured, except along the border, from above the anterior superior spine. The width of the pelvis, measuring from this spine to the edge of the pubis at the symphysis, is two feet eleven inches, which gives a total breadth of the pelvis of five feet ten inches, without allowing for the cartilage, which must, in the living condition, have intervened at the pubic and sacro iliac symphyses. The pubis, from the anterior to the posterior edge, is six inches in extent. The longest diameter of the foramen thyroideum is eight inches; the transverse diameter five inches.

We were led to make this measurement of the pelvis with the greater care, because CUVIER makes the following remarks on the subject of its width:— "Mr. Peale states that the width of the pelvis of his skeleton is five feet eight inches, (Engl.) but I fear that this is a typographical error, or that he meant it for the measure of the circumference."*

The difference between the measurement of the pelvis stated by R. PEALE, and that given by us, is owing to the circumstance of our having measured different skeletons. His measurements were made on the skeleton now in Baltimore; ours were carefully taken from that in the Philadelphia Museum.

It was first stated by R. PEALE, and subsequently confirmed by CUVIER, that these bones are more depressed than in the elephant. This indicates, says this Zoologist, that the belly must have been smaller, and consequently the intestines less volu-

* Oss. Foss. tom. 2.

minous, than in the elephant; this, together with the structure of its teeth, concurs in causing the mastodon to be regarded as less exclusively herbivorous than from other circumstances is commonly inferred.

The Femur, or Thigh-Bone.—This bone is perfectly preserved, and is a fit column for the support of so large a superstructure. It is three feet seven inches long, and eight inches in diameter at the middle of its shaft; the whole of the middle part of the bone is peculiarly flattened. The neck of this thigh-bone, which is six inches and three-fourths in diameter, on a level with the top of the trochanter, is a very strong process, and is surmounted by a head seven inches in diameter. The great or external trochanter, projecting below and opposite the neck of the bone, is a strong and massive process, having a large depression at its basis on the posterior surface of the bone. The lesser or internal trochanter does not exist, except as a slightly extended roughness on the inner edge of the bone. The transverse diameter of the articulating surfaces or condyles of the femur is nine inches and five-eighths; of each condyle, four inches and a-half.

The Tibia and Fibula, or Leg-Bones.—The tibia is two feet long, and in strength and solidity is well proportioned to the femur; it is ten inches broad at its superior portion, and seven inches and seven-eighths at the inferior part. Its diameter in the middle is four inches and five-eighths.

The fibula is comparatively slight and slender, and occupies the same relative position in the mastodon as in the human subject. Its superior extremity is

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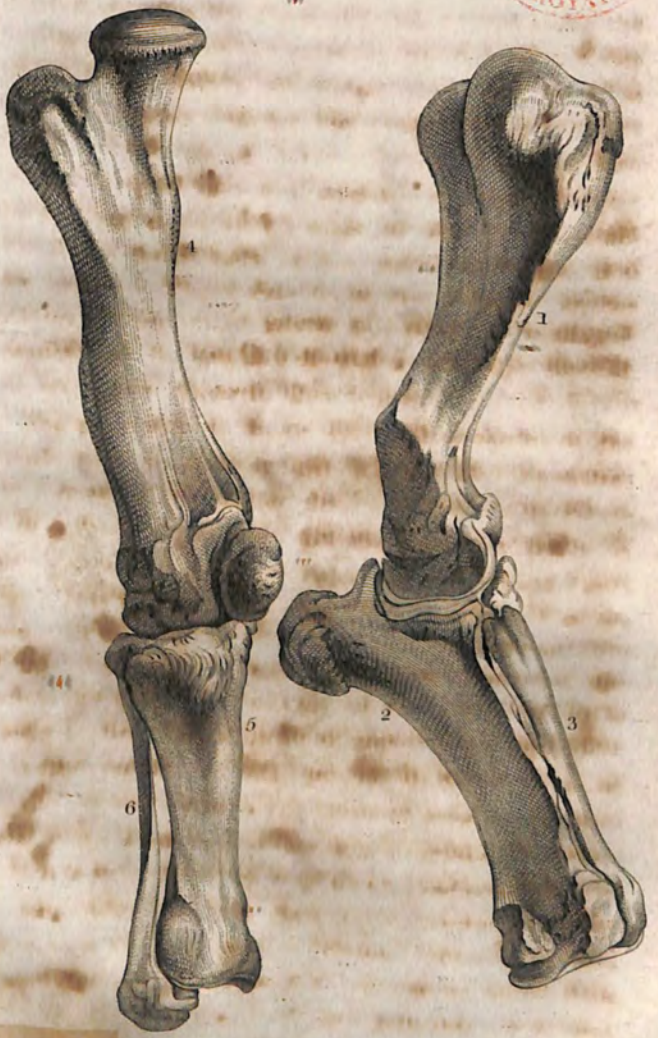
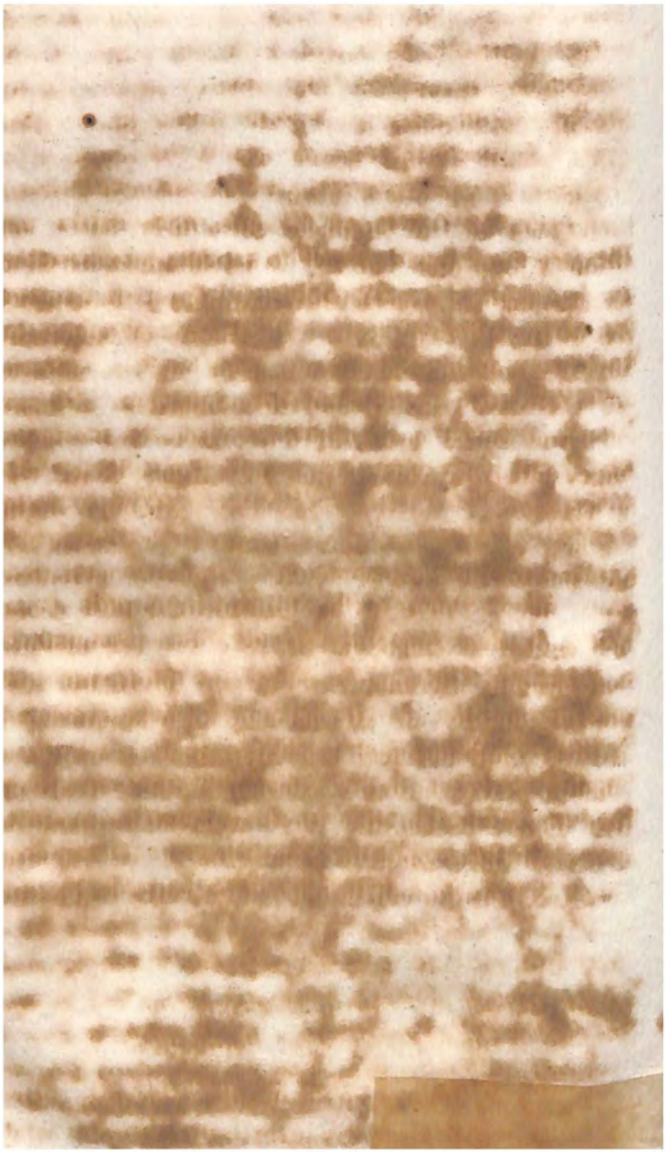


MASTODON

4. Femur
5. Tibia
6. Fibula



closely united to the superior and posterior part of the tibia; its inferior extremity passes below that of the tibia for three inches and a-half, constituting the support of the outer part of the ankle joint. The whole length of the bone is twenty-six inches.

The bones of the *tarsus* are very analogous to the same bones in the elephant, but appear flatter and thinner in proportion. The articulating surface of the astragalus is remarkably flat, and is five inches broad from the anterior to the posterior edge; the thickness of the bone, measured on the anterior surface, is two inches and three-quarters. The os calcis, measured on its inferior surface, is six inches long, and is a very large and strong bone. Its surface for articulation with the extremity of the fibula, is four inches and a-half in length, from its anterior to the posterior edge. The os naviculare is five inches long; its breadth in the middle is one inch and three-quarters. The internal cuneiform bone sustains the metatarsal of the internal or first toe; the middle and external cuneiform sustain a part of the second and medial metatarsal bones, while the cuboid receives both the external, or the fourth, and little toe. The length of the first metatarsal is three inches; of the second three and three-fourths; of the third five; of the fourth four and a-half; of the fifth four.

Localities whence Mastodon bones have been obtained in greatest abundance.

Among the earliest localities discovered was Big-bone Lick, in Kentucky, which derived its name

from the great number of fossil bones there found. This celebrated lick is a morass, or marsh-like valley, surrounded by considerable hills, and is about four miles south-east of the Ohio, and nearly opposite to the mouth of the Great Miami river. The basis of this morass is a black and fetid mud, and the water that oozes through it is impregnated with saline matter. At present this spot is much frequented by inhabitants of the western country, on account of its excellent mineral springs, which are found useful in relieving the system from various states of disease, but more especially from the peculiar affections caused by the common autumnal fevers of the country. The principal spring yields large quantities of very limpid water, which is highly charged with sulphuretted hydrogen gas, immediately blackening silver vessels, or implements plated with that metal.

From the vast number of bones of various extinct and recent species obtained from this locality, it is evident that, previous to the peopling of the surrounding country, it was resorted to by animals for the purpose of gratifying their appetite for salt, so abundantly contained in the waters oozing from such places. From the position in which many of the bones, especially of the larger quadrupeds, have been found, it is highly probable that they may have perished in consequence of the peculiar softness of the soil:—their great weight causing them to sink deeply, while their strength was rendered entirely unavailing for want of firm materials, against which exertions could be effectually made.

In the year 1807, Thomas Jefferson, then pre-

sident of the United States, requested governor CLARKE, previously so justly distinguished by his travels in company with Capt. LEWIS to the Pacific Ocean, carefully to explore the ground at Bigbone Lick. His researches were rewarded by a large collection of bones belonging to various species, which were sent to the city of Washington, and by the philanthropist and sage then at the head of our government, they were afterwards divided between the American Philosophical Society, the National Institute of France, &c.

MITCHILL informs us that bones of the mastodon "were found in July, 1817, in the east branch of the White River, a stream emptying into the Wabash, at a point distant forty-four miles in a right line from the mouth of the Wabash. This east branch unites with the west branch at a point twenty-nine miles in a direct line from the mouth of the White River. The intelligence was communicated by Josiah Meigs, Esq. commissioner of the general land office, in the treasury department of the United States, who received it from Mr. Spotts, living near the falls of the east branch. These consisted, it is stated, among others, of the upper jaw, whose width from outside to outside was twenty and a-half inches; length twenty-five inches; length of the posterior grinder (composed of five divisions in three rows) seven and three-fourths inches; breadth of the same across, five and a-half."*

* See the interesting observations on the Geology of North America, by this zealous and distinguished votary of science, appended to his edition of Cuvier's Theory of the Earth, p. 368.

According to JEFFERSON, these bones are also found on the North-Holston, (36° N. Lat.) a branch of the Tennessee river, west of the Alleghanies in Carolina, and were also obtained from a morass similar to those containing these bones in other places.*

Subsequently, bones of the mastodon were found still farther south in different parts of Louisiana west of the Mississippi, but always in the river Alluvions.†

In Wythe county, Virginia, near Green Briar county, whence the bones of the megatherium were obtained, a large number of bones, probably almost an entire skeleton, was obtained. This interesting discovery was first made known by Bishop MADISON, in a letter to the late professor B. S. BARTON, who published an account of it in his Medical and Physical Journal. "But what renders this discovery unique among others, (says CUVIER, vol. ii. ed. 1, Oss. Foss.) is that in the midst of the bones was found a half triturated mass of small branches of gramina, and of leaves among which it was believed that a species of reed still common in Virginia could be recognized, and that the whole seemed to be enveloped in a sort of sac, which was considered as the stomach of the animal; so that there was no doubt but that these were the very substances upon which the animal had fed."

This information was communicated to the Zoologist by Dr. B. S. Barton in a letter which runs thus:—"Without further delay, I hasten to inform you of a recent discovery relative to the mammoth

* Notes on Virginia.
† Am. [illegible]

or American elephant. If the facts be as I state them, I think you will not hesitate to consider the discovery one of the most interesting that has been made for a long time. I may add that such a discovery was hardly to be expected by the most sanguine or enthusiastic zoologist. Very lately, in digging a well near a salt-lick in the county of Wythe, in Virginia, after penetrating about five feet below the surface of the soil, the workmen struck upon the *stomach* of one of those huge animals, best known in the United States by the name of the mammoth. The contents of the viscus were carefully examined, and were found to be 'in a state of perfect preservation.' They consisted of half-masticated reeds, (a species of Arundo or Arundinaria, still common in Virginia and other parts of the United States,) of twigs of trees, and of grass or leaves."*

The best comment that can be offered on this discovery is the original letter of the learned and excellent Bishop MADISON, from which it will appear that he never saw the *place* nor the *thing* which was supposed to be the *stomach*, neither is the evidence given with sufficient conclusiveness to establish *any opinion* on the subject. We take the liberty of proving this by italicising some parts of the bishop's letter:

"One of those facts has lately occurred, which the naturalist knows best how to appreciate, and which I, therefore, take a pleasure in communicating to you. It is now no longer a question whether the

* Barton's Med. & Phys. Journal, vol. iii. p. 23 of first supplement.

mammoth was a herbivorous or carnivorous animal. Human industry has revealed a secret, which the bosom of the earth had, in vain, attempted to conceal. In digging a well near a Salt-Lick, in Wythe county, Virginia, after penetrating about five feet and a-half from the surface, the labourers struck upon *the stomach of a mammoth*. The contents were in a state of *perfect* preservation, consisting of half-masticated reeds, twigs, and grass, or leaves. There *could be no deception;* the *substances* were designated by *obvious characters*, which *could not be mistaken*, and of which *every one* could judge; besides, the *bones of the animal lay around*, and added a silent, but sure confirmation. The whole rested upon a lime-stone rock. I *have not seen*, as yet, *any part of those contents;* for, *though I was within two days' journey of the place where they were found, I was so well satisfied with the narration of gentlemen who had seen them, and upon whose veracity, as well as accuracy,* I *could rely, that I thought the journey* UNNECESSARY; especially as I took measures to ensure the transmission of a sufficient quantity of the contents, together with all the bones, to Williamsburgh. When the contents arrive, a part shall be forwarded to you. I hope to form a complete skeleton of this vast animal, having given directions to spare no labour in digging up every bone.

[Then follows a sentence cited from Blumenbach, showing how the soft parts of animals may be preserved, after which the letter concludes in the following manner:]

"Whether this first kind of petrifaction, of which Blumenbach speaks, and which he calls *simplement calcinés*, has been the cause of the preservation of these substances, or whether it be the effect of the marine salt, with which the earth, where they were buried, has been constantly charged, must be left to future investigation. I pretend not to decide. *Had they been buried deep in the earth*, that circumstance alone might have prevented a decomposition; *but the depth of five or six feet* seems insufficient to arrest that chemical action, which changes the appearances of organized bodies. *The fact*, however, is *decisive, as to the principal question. It* has summoned the discordant opinions of philosophers *before a tribunal from which there is no appeal.*"*

Such is the letter of Bishop Madison; and thus the discovery remains at the present day. Dr. Barton's letter, first quoted, consists of little more than the same matter in other words. It is much to be regretted that the worthy prelate did not inspect this locality, and ascertain for himself, by scrutinizing all the collateral circumstances, whether this *stomach*, so confidently pronounced to be that of the mastodon, might not have belonged to some domestic animal, which had perished from disease, and been interred "at a depth of five or six feet," and by accident, in the immediate vicinity of mastodon bones. Neither the dimensions, figure, nor peculiar nature

* Bishop Madison subsequently corrected the impression made by this letter, acknowledging that his information was inaccurate, and his conclusions too hastily adopted.

of this stomach is described, nor do we know that it was such, except upon the hearsay evidence contained in the bishop's letter. Dr. Barton tells us of the specific nature of part of the matter, but does not say whether he had examined it himself or not, though it is probable he had received a specimen. We think but one opinion can be formed on the subject—whatever this *stomach* may have been, or whatever was the nature of its contents, its connexion with the bones of the mastodon was altogether *accidental*. It would be something very singular indeed, when the strongest animal fibres, the ligaments, tendons, muscles, &c. had all disappeared, that the stomach alone "at a depth of five or six feet," should escape almost uninjured!

In the year 1817 Professor MITCHILL, in company with Dr. PETER S. TOWNSEND and several other gentlemen, explored a small meadow in the vicinity of Chester, near Goshen, in Orange County, New York. Ten years previously some bones had been disinterred at that place, and some of them still remained at the bottom of a ditch.

This ground had been successfully drained and converted into a meadow. The surface was covered by a fine grassy sward, beneath which was a soil composed of a bed of black peat turf, six feet in thickness. "The soil and sward were about four feet thick over the bones; beneath them, and immediately around them, was a stratum of coarse vegetable stems and films, resembling chopped straw, or rather drift stuff of the sea, for it seemed to be mixed with broken films of conferva, like those of the Atlantic shore."

As these bones were found in a peat-bog containing no marl, the bones were far more rotten than those obtained from the marl pits by Messrs. PEALE. It was impossible to extract them entire, and it was equally so to reunite the fragments after their exhumation. The bones discovered consisted of parts of the feet, legs, shoulder-blade, back-bone, rump, lower jaw, upper jaw, teeth and tusks.

The teeth were uninjured, and more than half of the lower jaw was preserved; but the condyles and angles of the other side broke in pieces when handled. The upper jaw, with its teeth and tusks, were found retaining their natural connexions. When the mud was carefully removed from them, the palate bones and teeth were found to be uppermost, as if the animal had perished on its back. The tusks differed in size, length and curvature; the right one measured seven feet in length, and was thicker and blunter than the left, which was nearly nine feet long, more regular tapered and pointed.

Dr. MITCHILL concludes his account of this interesting research, by stating that "the flatness of the cranium, the connexion of the tusks with the head by exsertion and not by gomphosis, and the insertion of the grinders into them at their origin, will not fail to attract the attention of zoologists."*

These circumstances do not, however, appear to us very extraordinary, when taken in connexion with the facts previously stated. The bog was one containing no marl, or other antiseptic agent, and

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* Mitchill's Geological Appendix to Cuvier's Theory of the Earth, p. 379.

the soil covering these bones was a bed of black peat turf, soaked in a large quantity of fluid. These bones were very rotten, and doubtless much decayed before the draining was begun. As the whole superincumbent soil settled, in consequence of the removal of the water, it appears highly probable that at the same time the water was withdrawn from the mud within the decayed skull, and the whole mass of decayed bone was flattened by the general pressure caused by the subsiding soil. Thus we would account for the appearances so faithfully noted in the above mentioned instance. In a recent conversation with Dr. TOWNSEND, who aided professor MITCHILL on that occasion, and made accurate drawings of the bones as they were found, he expressed his entire belief in the probability of the explanation here given.

The *apparent* exsertion of the tusks we would attribute to the entire destruction and removal of the inferior portions of their sockets, formed by the intermaxillary bones. To the causes above stated, we attribute the *apparent* insertion of the grinders into the roots of the tusks, producing the softening and subsequent compression of the alveolar processes, together with the approximation of all the inferior and superior walls of the skull. We are fully convinced that these bones were in the relative positions so well described by MITCHILL. But that such was the relation of parts in the living animal, or in the sound skeleton, is forcibly denied by the two nearly entire skeletons of Philadelphia and Baltimore, as well as by fragments preserved in various cabinets of natural history.

In Rockland county, N. Y. eleven miles west of

a spot where fragments of bones belonging to land-animals were found imbedded in sand-stone, by Dr. MITCHILL, at a distance of thirty-two miles from the city of New York, the remains of a mastodon were found in July 1817. They consisted of a set of grinders, which were accidentally discovered by a ditcher, in mud only three feet below the surface. They were large, having remarkably white and glossy surfaces; the roots were much decayed. Mr. EDWARD SUFFERN, Jr. who presented these teeth to Professor MITCHILL, informed him that the cavities of these teeth contained a fatty substance when they were first discovered. This, however, had entirely disappeared before they were received by Dr. Mitchill.

In the year 1811, the remains of a mastodon of the species we have been describing was found on the banks of York river, about six miles east of Williamsburgh, in Virginia. They lay upon marsh-mud, or buried a few feet within it, and were surrounded by the roots of cypress trees. The trees which these roots once supported had long been removed, and the difference between the level where the bones and roots are found and the top of the adjacent bank, is more than twenty feet. This locality was carefully examined by the Rev. Bishop MADISON, then president of William and Mary College, Va. who gave the details of the discovery to Dr. MITCHILL.* The parts of the skeleton obtained were the pelvis bones, a thigh-bone, two vertebræ, two ribs, nearly perfect,

* See the Medical Repository, (N. Y.) xv. 388.

two tusks, not greatly injured, and seven molar teeth, four of which were in their sockets, apparently part of the lower jaw. The largest tooth weighed seven and a-quarter, the smallest three to four pounds.

Various other localities have been mentioned, where bones of the mastodon and other large quadrupeds have been disinterred. At the Salines of Great Osage river they are said to be very abundant, as much so as at Bigbone Lick, or in the vicinity of the Waalkill.* Darby, the geographer, states in a letter to Dr. Mitchill, that while in Louisiana, in 1804, he visited Opelousas, within a few days after the exhumation of part of an under jaw and teeth of a mastodon.† We have been informed by our friend Dr. Griffin, of Virginia, that the greater part of a skeleton of this animal was disinterred a few years since, in Bottetourt county, Va. These bones were in very good preservation.

There is every reason to believe that the bones of this gigantic animal, as well as the relics of various other extinct species, will be procured in great abundance as the internal improvement of our happy country advances. The magnificent works already completed have given no inconsiderable earnest of what may be expected from numerous others now in progress, and the means which are intended to facilitate the intercourse of our citizens, and bind them more firmly together by mutual interests, may also contribute in a powerful degree to shed light on some of the most obscure and interesting topics connected

* Vide Breckenridge's View of Louisiana.
† Mitchill's Geological Appendix.

with the history of the globe. It should, therefore, be deeply impressed upon the minds of those who superintend the construction of canals, tunnels, roads, &c. that the fragments of organic remains which they might feel inclined to neglect as insignificant, may prove of the highest importance to science, when viewed in connexion with all the circumstances of their characters and positions, the peculiar nature of the superincumbent soil, and the general aspect of the surrounding country. When opportunities are presented, no pains should be spared, in order to procure bones, or other relics of animal bodies, with the least possible delay; and every attendant circumstance should be noted with the most scrupulous accuracy.

The last mastodon skeleton disinterred, was found in Monmouth county, New Jersey, three miles southwest of Long Branch. A grinder was presented by Mr. William Moore to the Lyceum of Natural History of New York, accompanied by information that the whole skeleton lay buried near the spot whence this tooth was obtained.*

This skeleton was accidentally discovered on Poplar farm, which is about two miles distant from the sea-beach, in 1823, fourteen months previous to the researches of Messrs. Cooper, Dekay and Van Rensselaer. The proprietor of the farm walking over a reclaimed marsh, observed something projecting

* See the Report of Messrs. Dekay, Van Rensselaer and Cooper, vol. i. p. 143 of the Annals of the Lyceum, whence this account is derived.

through the turf, which he struck loose with his foot and found to be a grinder tooth. Two other teeth, some pieces of the skull, the spine, humeri, and other bones, were afterwards exhumed.

The country adjacent to this farm is generally level, but a low and broad ridge, running parallel with the sea-coast, lies between it and the sea. At Poplar this high ground very gradually slopes on its western side, now disencumbered of its forests, and intersected by ditches, so that at some seasons it is nearly dry. It is stated to have been watery at a former period, and abounded in a species of poplar, whence the place obtained its name. Near the border of this marsh there was a shallow cavity containing a little water; the left foreleg had been removed therefrom, and several broken vertebræ and fragments of other bones were scattered on the surrounding turf. Having obtained permission to make farther explorations, these zealous inquirers commenced operations, and during two days, with the aid of some gentlemen who accompanied them, succeeded in obtaining all the bones of this skeleton which remain undecomposed. This valuable collection was added to the cabinet of the Lyceum, previously enriched by the specimens obtained at Chester county in New York.

The following is the account given by these gentlemen of the position in which the animal appeared to have been placed at the time of its extinction, whatever may have been the catastrophe which destroyed the whole of its race:

The surrounding soil "was a stratum of what is, by the German geologists, called *geest*, that is, a black, soft, shining earth, abounding near the sur-

face in vegetable roots and fibres. Before the time of our visit, the skull, broken into many fragments, as well as the greater part of the spine, most of the ribs, both scapula, the left radius, ulna, and the humerus of the right arm, had been removed. Of the situation of these, therefore, we cannot speak from our own observation; but Mr. Croxson informed us, that, as before mentioned, part of the head had protruded itself through the surface of the ground. In consequence probably of this, it was so much decayed that he could find but three of the teeth, and no trace whatever of the tusks, nor was the search we afterwards made for these latter more effectual. The vertebral column, with all its joints, and the ribs attached to them in their natural position, lay about eight or ten inches below the surface. The scapulæ rested upon the heads of the humeri, and these in a vertical position upon the bones of the fore arm, as in life. We found the right fore arm still buried. It inclined a little backwards, and the foot, which was immediately below it, was placed a little in advance of the other, as it would be if the animal had been walking.

"At the depth of about ten inches, and immediately below the matting of turf, which forms the surface of the meadow, we came to the sacrum, with the pelvis remaining united to it, though in a very decayed state. The femora lay adjoining, but, unlike the bones of the fore legs, in a position nearly horizontal, the right less so than the left, and both at right angles with the spine. These were also, from their proximity to the surface, much decayed, so that the left fell to pieces on being lifted from its bed. Both tibiæ, each with its fibula, stood nearly

erect under the extremities of the femora, and under them the bones of both hind feet in their proper relative position. We found no caudal vertebræ. The marsh had been cleared and drained about three years, and during that period, as the proprietor informed us, the level of its surface had lowered about two feet. To this may have, perhaps, been owing the horizontal position of the thigh bones, which would naturally be forced out of their originally erect position by the pressure of the heavy superincumbent bed of turf. The bones of the fore leg, however, do not appear to have been thus acted upon.

"The deeper we penetrated the sounder we found the bones, so that those of the foot, lying lowest, were obtained in a state of perfect preservation. The greater part of the bones had, adhering to their surface and in their cavities, the phosphats of iron and lime, and the sulphat of lime in very small quantities, the last in minute crystals. There were also considerable masses of oxyd of iron or bog ore, which, however, abounded in various places in the marsh. Immediately underlying the stratum of black earth, we came to another of sand, having a ferruginous tinge, and containing numerous rolled quartz pebbles. Upon this sandy stratum the skeleton seemed to stand, so that the upper side of the foot was covered by the black earth; the sole rested immediately upon the sand. We found all the feet placed thus, the surface of the sandy stratum being apparently quite level."*

* Annals of the Lyceum, &c. vol. 1. p. 145.

CHAPTER XVI.

Genus III.—Elephant; *Elephas*; L.

GENERIC CHARACTERS.

The head is of great size, supported upon a singularly short neck; the eyes are small, the ears of great extent, and, like the eyes, placed laterally. The snout is drawn out or extended to form the flexible trunk, through which is continued two canals leading from the nostrils: the extremity of the trunk is furnished with a small process, which both from its figure and mobility appears to perform the duties of a finger. The openings to the true nasal cavities are situated very high upon the head, and the bones of the nose are very thick, small, and triangular. The sinuses or cavities between the plates of the frontal and maxillary bones are enormously large, and increase to a great degree the volume of the skull. The lower jaw is massive and rounded at its angle: its branches terminate at the chin in a pointed extremity, between the sides of which there is a deep gutter or furrow.

The body is very large, and sustained at a considerable height from the ground by long and strong bones, whose articular surfaces are arranged upon a vertical line. The head of the thigh bone is in the axis of its shaft, and the cotyloid cavity for its re-

ception is situated far forward, or rather on the inferior surface of the pelvis. The limbs are five-toed, but the digits are entirely concealed by the integuments, though their situations are designated externally by an equal number of horny plates, or small hoofs, on the inferior surfaces of the feet. On the hind feet one or two of these plates are sometimes deficient. The tail is of moderate length, and terminated by a brush or tuft of coarse hairs. The stomach is simple, the intestines of great volume, and the cæcum of vast magnitude: the liver has two lobes, but no gall-bladder. The teats, two in number, are situated upon the chest between the fore limbs.

Dental System.

10 Teeth { 6 Upper { 2 Incisive, (in the form of great tusks) 4 Molar. / 4 Lower { 4 Molar.

The superior incisive teeth are, in this genus, represented by tusks of ivory, which are frequently of great length and thickness. They are cylindrical, arcuated downwards, and turned up at the point. Their texture consists of a peculiar osseous matter of a fine grain, which is intermingled with a harder and more compact substance, arranged in convergent curved lines, which cross each other so as to form very regular curvilinear lozenges. There is, moreover, a slight covering of true enamel to these tusks.

The molar teeth are made up of vertical and transverse layers, each of which is formed of osseous matter, surrounded by a plate of enamel, and

the whole connected together by a solid inorganic substance or cement. These teeth grow obliquely from the posterior to the anterior part of the jaw.*

Species 1.—*The Fossil Elephant.*

Elephas Primogenius; Blumenb.

Elephant Fossile, ou du Mammouth des Russes. C. Ossem. Foss. Nouv. ed. i. 75. Mitchill, Geological Appendix to Cuvier's Theory of the Earth.

The discovery of elephant bones in North America is a curious fact, which forcibly arrests attention and invokes a train of far-extending reflections relative to the mutations produced in the animal world, by the irresistible causes which, at various periods, have entirely changed the condition of the earth's surface. In the early ages of the world the fossil elephant, now utterly extinct, must have been extensively and abundantly distributed over the earth, as fragments of its skeleton have been disinterred not only in Asia, and throughout Europe, but in va-

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* See Desmarest, *Mammalogie*, p. 381. F. Cuvier, *Des dents*, etc. p. 221, and for a most luminous and ample account of the dentition of this genus, the reader may with great profit refer to the paper on Living and Fossil Elephants, contained in the first volume (new edition) of Cuvier's Recherches sur les Ossemens Fossiles. Corse, in the Philosophical Transactions, 1799, has given a great number of interesting details. Blake's work on the structure and formation of the teeth in man and various animals, is also of great value, in relation to these teeth.

rious parts of North America. From the greater numbers of bones which have been discovered, and the fortunate preservation of the entire animal, in the almost eternal ice of Siberia, less doubt is felt concerning the peculiar characters of this than any other extinct species.

Two living species of elephant are well known as inhabitants of Asia and Africa, whence they are named; the varieties of these species are neither numerous nor remarkable. The Asiatic is distinguished from the African by superior size and other peculiarities, the most striking of which is the arrangement of the perpendicular plates in the huge grinders; these in the first named species exhibit transverse undulating ribbons of enamel, while those of the African display on their crowns a succession of lozenge-shaped lines. The teeth of the fossil elephant resemble the Asiatic, but have straighter and narrower ribbons of enamel.

The localities whence the fossil elephant bones have been generally procured in this country, have in numerous instances been the same as those indicated in speaking of the mastodon. Scarcely any remains, except the teeth, have been discovered in these situations; the other bones having altogether decayed, would indicate that this elephant must have perished anterior to the remote period in which the mastodon bones were deposited in the same places. Kentucky, so remarkable for containing great numbers of the mastodon, has furnished the largest number of the teeth of the fossil elephant, but the state of South Carolina has thus far been found to contain the greatest quantity of other parts of the skeleton.

Mitchill has given a figure of a fossil elephant-tooth, obtained in Monmouth Co. N. J.*

Drayton informs us, in his views of South Carolina, that Col. SENF, in 1794, discovered teeth of the elephant in Biggin Swamp, not far from the head of the west branch of Cooper river. They were found at a depth of eight or nine feet. A good figure of one of these grinders is given in Drayton's work.

According to Catesby, teeth of an elephant were found at Stono in Carolina, which were reaognized by the Negroes (natives of Africa) as the grinders of that animal. This statement of Catesby is unnecessarily criticised by CUVIER, after Dr. B. S. Barton, since Catesby does not say that the Negroes recognized them as teeth of the African species of elephant, but merely that they were teeth of *an* elephant.

Dr. H. Hayden, of Baltimore, in his Geological Essays, gives an account of an elephant-tooth, which was found on the eastern shore of Maryland, in Queen Ann's county. This tooth differs considerably from the tooth either of the living or fossil species, resembling each in a certain degree. The distance from the crown to the roots of the tooth is nine inches; the grinding surface is also nine inches long, and the breadth four inches and a-half. Its present weight is ten pounds, and from the convexity of its outer surface, it is thought to be a grinder of the upper jaw.

The collection of the Philadelphia Museum is enriched with various specimens of fossil elephant-

* Mitchill, libro citato.

teeth; and the cabinets of the American Philosophical Society, and of the Academy of Natural Sciences, contain numerous fragments of the skeleton of this animal.*

The characters by which the skeleton of this elephant is to be distinguished from the others, have been laid down by Cuvier, after a very extended and minute examination of vast numbers of perfect and mutilated specimens. The head is oblong, the forehead concave; the sockets for the tusks very large, and the molar teeth of great size. They are marked on the surface by parallel plates of enamel, very closely approaching each other. The lower jaw is obtuse in front. The tusks are exceedingly long, more or less arcuated spirally, and directed upwards.

We cannot offer any facts from which a sufficiently satisfactory conclusion can be drawn, relative to the time or manner in which this species became extinct; but the evidence afforded by the specimen obtained from the Siberian ice, renders highly probable the supposition that it was adapted to a much more northern climate than either of the elephants now known. The skin of this animal was covered with a long and coarse hair,† and by a finer and woolly

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* See Appendix, E.

† Cuvier, who received a piece of the skin of this animal, states that there are two, and even three, sorts of hair. The longest are from twelve to fifteen inches, of a brown colour, and about the thickness of horse-hair. Others are nine or ten inches long, rather more slender, and of a fawn colour. The wool, which seems to have been placed at the roots of

hair, which is shorter and applied more closely to the surface.

The number of the relics of this animal found in Siberia is very great, and it is highly probable that the northern parts of this continent may hereafter furnish us with sufficient proofs of its abundant diffusion in the species. The explorations annually made in different parts of our southern and western country will doubtless enlarge our knowledge of this species, and afford data upon which opinions may hereafter be more advantageously based.

[We shall conclude this article by inserting a translation of great part of Mr. Michael Adams' account of his visit to the Siberian mammoth, or extinct elephant, which was through his zealous exertions preserved from final destruction, and at present belongs to the museum of St. Petersburg.

"I was informed at Yakoutsk, by M. Popoff, who is at the head of a company of merchants of that town, that they had discovered upon the shores of the Frozen Sea, near the mouth of the river Lena, an animal of extraordinary size, having the flesh, skin and hair in good preservation. It was believed that the fossil production known as mammoth-horns must have belonged to an animal similar to this. I commenced my journey on the 7th of June, 1806; on the 16th I arrived at the small town of Schigarsk, and near the end of the month reached Kumak-surka, whence my excursion was made to search for the

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the long hairs, is four or five inches long, somewhat fine and soft, and slightly curled, at its root especially: this is of a clear fawn colour.

mammoth. Accompanied by a Tonguse chief, *Ossip Schoumakoff*, and by Bellkoff, a merchant of Schigarsk, together with my huntsman, three Cossacs, and ten Tonguse, we set out upon our journey, mounted upon reindeer.

"On the third day of our journey we pitched our tents a few hundred paces from the mammoth, upon a hillock called *Kembisugashaeta*, signifying the stone with a broad side. Schoumakoff related the history of the discovery of the mammoth to me, in nearly the following words:

"The Tonguse, who are a wandering people, seldom remain long in one place. Those who live in the forests often spend ten years and more in traversing the vast regions among the mountains—during which period they never visit their homes. Each family lives separated from the rest; the chief takes care of them, and knows no other society. If, after several years of absence, two friends casually meet, they then mutually communicate their adventures, the various success of their hunting, and the quantity of peltry they have acquired. After spending some days together, and consuming their small stock of provisions, they separate cheerfully, charge each other with messages to their respective friends, and trust to chance for their future meetings. The Tonguse who inhabit the coast differ from the rest in having more regularly built houses, and in assembling at certain seasons for fishing and hunting. In winter they inhabit cabins built close to each other, so as to form small villages. It is to one of these annual excursions of the Tonguse that we are indebted for the discovery of the mammoth.

"Towards the end of August, after the fishing in the Lena is over, Schoumakoff is in the habit of going, along with his brothers, to the peninsula of Turmut, where they employ themselves in hunting, and where the fresh fish of the sea furnish them with wholesome and agreeable nourishment.

"In 1799 he built for his women some cabins upon the shores of the lake Onroul; and he himself coasted along the sea-shore in order to seek for mammoth-horns. One day he observed, in the midst of a rock of ice, an unformed block, which by no means resembled the pieces of wood usually found there. He clambered up the ice and examined the new object on all sides. The ensuing year he found at the same spot the carcase of a walrus, and remarked that the mass he had formerly examined was freer from the ice, and by the side of it he perceived two similar pieces, which he afterwards found were the feet of the animal. About the close of the next summer, the entire flank of the animal, and one of the tusks, had distinctly come out from under the ice. Upon his return to the shores of the lake Onroul, he communicated this extraordinary discovery to his wife and some of his friends; but their manner of regarding the subject overwhelmed him with grief. The old men related, on this occasion, that they had heard their forefathers say that a similar monster had formerly shown itself in the same peninsula, and that the whole family of the person who had discovered it had become extinct in a very short time. In consequence of this, the mammoth was regarded as auguring a future calamity, and the Tonguse chief felt so much inquietude from it that he fell dangerously

ill; but recovering again, his first suggestions were of the profit he might gain by selling the tusks of the animal, which were of extraordinary size and beauty. He therefore gave orders that the place where the animal was found should be carefully concealed, and all strangers removed from it under various pretexts, charging at the same time some trusty dependents not to suffer any part of this treasure to be carried away.

"The summer proved colder and more windy than usual, and kept the mammoth sunk in the ice, which scarcely melted all that season. At last, about the end of the fifth year afterwards, the ardent desires of Schoumakoff were happily accomplished: the ice which enclosed the animal having partly melted, the level became sloped, and this enormous mass, pushed forward by its own weight, fell over upon its side on a sand-bank. Of this, two Tonguse, who accompanied me in my journey, were witnesses. In the month of March, 1804, Schoumakoff came to his mammoth, and having cut off the tusks, exchanged them with the merchant Baltounoff for goods of the value of fifty rubles. On this occasion a drawing of the animal was made, but it was very incorrect; they described it with pointed ears, very small eyes, horse's hoofs, and a bristly mane along the whole of his back, so that the drawing represented something between a pig and an elephant.

"Two years afterwards, being the seventh from its first being discovered, a fortunate circumstance caused my visit to these distant and desert regions, and I congratulate myself upon having had it in my power to ascertain and verify a fact which would

otherwise be thought so improbable. I found the animal still in the same place, but exceedingly mutilated. The prejudices against it having been dissipated by the Tonguse chief's recovery, the carcase might be approached without difficulty: the proprietor was content with the profit he had derived from it, and the Yakouts of the neighbourhood tore off the flesh, with which they fed their dogs. Ferocious animals, polar bears, gluttons, wolves, and foxes, preyed upon it also, and their burrows were seen in the neighbourhood. The skeleton, almost unfleshed, was entire, with the exception of one of the fore feet. The back-bone, from the head to the os coccygis, the pelvis, and the remains of the three extremities, were still firmly attached by the ligaments of the joints, and by strips of skin on the exterior side of the carcase. The head was covered with a dry skin; one of the ears, well preserved, was furnished with a tuft of bristles. All these parts must necessarily have suffered by a carriage of several thousand miles. The eyes, however, are preserved, and we can still distinguish the ball of the left eye. The tip of the under lip has been eaten away, and the upper part being destroyed, the teeth were laid bare. The brain was still within the cranium, but appeared dry.

"The parts least damaged are a fore foot and a hind one; they are covered with skin, and still have the sole attached. According to the assertion of the Tonguse chief, the animal had been so large and well fed that its belly hung down below the knee-joints. This animal was a male with a long mane at

his neck, but it has no tail and no trunk.* Three-fourths of the skin were obtained; the whole is of a dark gray, and covered with reddish hair and black bristles. The humidity of the soil where the animal had lain so long has deprived the bristles of some part of their elasticity. The entire skeleton is about nine feet and a-half high,† and is fourteen feet in length from the tip of the nose to the coccyx.‡ The tusks are nine feet long, and weigh, each two hundred pounds.§ The head alone weighs four hundred and sixty pounds.

"The bones were separated and arranged with scrupulous care; and I had the satisfaction of finding the other shoulder-blade, which lay in a hole. I afterwards caused the skin to be stripped from the side upon which the animal had lain: it was in good preservation. This skin was of such extraordinary weight, that ten persons, who were employed to carry it to the sea side, to stretch it upon floating wood, moved it with great difficulty. After this was accomplished, I caused the ground to be dug in various places, in order to see if there were any bones around, but chiefly for the purpose of collecting all the bristles, which the white bears might have trodden into the wet ground on devouring the flesh. This operation was attended with difficulty, on account of the deficiency of proper tools for digging; however,

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* These parts were, doubtless, removed by the animals which fed upon the carcase.

† Four archines. ‡ Seven archines. § Each five poods.

we succeeded in procuring more than forty pounds* of bristles.

"The place where I found this animal is sixty paces distant from the sea shore, and about one hundred paces distant from the ice, whence it had fallen down. The fracture in the ice is exactly in the middle between the two points of the isthmus, and is three wersts long, and in the place where the body of the animal was situated, the rock of ice has a perpendicular elevation of one hundred and eighty or one hundred and ninety feet. Its substance is a clear ice, but of a nauseous taste; it slopes towards the sea. Its summit is covered by a bed of moss and friable earth, more than a foot in thickness. During the heat of the month of July a part of this crust melts, but the other remains frozen. Curiosity prompted me to ascend two other hillocks equally distant from the sea; they were of the same composition, and also slightly covered with moss. At intervals I saw pieces of wood of an enormous size and of all the species produced in Siberia; and also mammoth horns (elephant tusks) in great quantities frozen between the fissures of the rocks. They appeared to be of an astonishing freshness."]

* More than one pood.

CHAPTER XVII.

Order VI.—Pecora; *Ruminant Animals.*

These animals are peculiarly distinguished by having no incisive teeth in the upper jaw, the intermaxillary bone, covered by a hardened gum, being opposed to the incisors of the lower jaw, which are almost universally eight in number. Between these and the molar teeth there is a vacant space, except in certain genera having one or two canines. There are very uniformly six molars on each side of both jaws; these have their crowns marked by two double crescents, the convexity of which in the upper jaw is turned inwards, and in the lower jaw outwards.

The feet are all two toed, and these toes are covered by two hoofs, which approach each other by flat surfaces, whence they have the appearance of a single hoof cleft in the middle, a circumstance which has obtained for these animals, in various languages, the designation of cloven footed, &c. In some genera, there are behind these hoofs two small ones or rudimental hoofs, which are the only traces of lateral toes. The two bones of the metacarpus and metatarsus are consolidated to form one bone, which is called the *cannon bone.*

The most singular faculty possessed by these animals is that of rumination, or of returning the food to the mouth to subject it to a second mastication af-

ter it has been once swallowed. This process depends on the number and peculiar arrangement of their complicated stomachs.

The first stomach is called *rumen* or paunch,* which is divided externally at its extremity into two saccular appendices, and slightly separated into four parts on the inside, having a vast number of flattened papillæ over the internal surface.

The second is called *reticulum* or honeycomb,† and is distinguished from the first by its small and globular appearance, and by the beautiful arrangement of its internal membrane, which forms polygonal acute-angled cells.

The third stomach is the smallest of all, and is termed *omasum* or feck.‡ Its internal membrane is arranged in longitudinal folds, varying in breadth, in a regular alternate order.

The fourth stomach is called *abomasum* or reed,§ is next in size to the paunch, and is of an elongated pear-shape, having its internal membrane simply wrinkled longitudinally like the human stomach.

The three first named stomachs are connected with each other and a groove-like continuation of the œsophagus in the following manner. The groove-like continuation enters where the paunch, reticulum, and omasum, approach each other, and thence it is continued with the groove which ends in the third stomach. The groove is therefore open to the first

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* Also ingluvies, magnus venter, penula.

† Ollula, bonnet, king's hood, &c.

‡ Echinus, conclave, centipellis, manyplies, book, feuillet.

§ Faliscus, ventriculus intestinalis.

stomachs which lie to its right and left. The thick and prominent margins of this groove allow them to be drawn together, so as to form a complete tube, and then the œsophagus is continued direct into the third stomach.*

The most generally received opinion on the act of rumination is, that the food is coarsely broken at the first mastication, and when swallowed passes into the paunch. It is thence gradually passed into the second stomach, where it undergoes a certain degree of maceration in the fluids of the organ, and is formed into little balls, which by a sudden contraction of this stomach are impelled through the œsophagus or gullet to the mouth. It is then subjected to the second more effectual mastication,† is again swallowed and passes directly into the third stomach, and after remaining in this for a certain time it finally enters the fourth, simple or true digestive stomach. This account of the stages of the act of rumination is adopted by BLUMENBACH, CUVIER, &c. TOGGIA‡ in part following the doctrine of BRUGNONE, sustains the opinion that the food, after the first mastication, enters the *paunch* only, and not the reticulum or second stomach. In the paunch, moreover, by the fluids which are poured out from its internal surface, and by the structure and regular movements of its parietes, the mass is softened, divided and formed into small pellets, which are brought by the contractions

* See Blumenbach's Comp. Anat. p. 137.

† Vide Cuvier, Regne Animal, 247.

‡ Della ruminazione e digestione de'Ruminanti; Turino 1819, 8vo. op. cit. per Ranzani.

of the organ to its cardia, and ascend the œsophagus to the mouth for the second mastication. Then the food is returned to the reticulum by means of the groove-like continuation; there it remains for a certain time, unless the matter be mixed or fluid, in which case it passes at once into the third or fourth stomach. Toggia is persuaded that it occurs in this and in no other way, because, 1st, when he had attentively examined the structure of the groove, he was convinced that nothing but finely comminuted food could pass through it, and not herbage but once and imperfectly masticated. 2d, When he examined the stomachs of ruminant animals killed either at the commencement of the rumination, during this process, or immediately after it, he found the food which had been only once masticated, in the paunch alone; the food reduced by the second mastication was contained in the reticulum or second stomach; that which was imbued with fluid in the omasum or third, and finally, abundantly mixed with fluids or in a semifluid state, in the abomasum or fourth stomach.*

The rumen or paunch is comparatively small in the young or suckling animal, and does not acquire its enormous size, until it has been for some time the receptacle of food. The intestinal canal is very long in ruminant quadrupeds, but not voluminous in the larger portion; the cœcum itself, is long and rather even. The teats are situated between the thighs.

The fat of these animals is remarkable for its

* Ranzani Elementi di Zoologia, tomo 2do. parte 3a.

hardness when cooled; it may then be broken into pieces. It is well known in commerce and the arts under the name of *tallow*.

To this order of animals man is more largely indebted than to all the rest of animated nature. The mass of his food, is obtained from their flesh, and there is no part of their bodies from which he does not derive additions to his comforts, and assistance to his arts. Their hides, horns, bones, hair, flesh, fat, milk, and even their blood are in hourly demand. Many of them during their lives yield him valuable services as beasts of draught and burthen, and contribute amply to his sustenance and luxury when they are finally slaughtered. Peaceful and patient in their dispositions, they feed exclusively on the verdure which is scattered over the earth, and prepare this vegetable matter most efficiently for the use of man and other creatures, by converting it into their own flesh, which is edible throughout all the members of the order, and in a large proportion is delicious food.

CHAPTER XVIII.

Genus IV.—Cervus: L. *Deer.*

Gr. Ἔλαφος.	*Fr.* Cerf.
Lat. Cervus.	*Germ.* Hirsch.

GENERIC CHARACTERS.

The head, which is elongated, is not very large, and most generally terminates by a smooth membranous surface which is called the muzzle; the nostrils are acutely oval and laterally situated; the eyes large and well proportioned, having the pupils transversely extended. At a short distance below the inner angle of the eye a peculiar pouch or cavity is found in most of the species, which secretes an unctuous humour in small quantities; these cavities are called *larmiers* by the French naturalist. The ears are large and pointed; the neck is of moderate length, the body plump, and the limbs slender, though strongly knit. The teats are inguinal, and four in number: the gall bladder does not exist in these animals. The tail is short.

The hair is very similar in colour throughout the species of this genus, and is dry and harsh; the young deer or fawns are mostly spotted with white upon a brownish yellow ground.

The males of this genus are all provided with horns, which are variously branched, or palmated, and are annually caducous. These horns are remarkable for being composed of *bone*, which is solid,

throughout, and in its first or growing state is covered by a velvet-like membrane, through which blood circulates with great freedom. The horn commences its growth from a basis or peduncle which is attached to the frontal bone, having something of the form of a truncated cone; a short distance above this, on the level of the outer surface of the skin of the head, the horn is expanded in the form of an irregular tuberculous ring, which is called the *burr*,* above which the solid part of the horn rises to form the various branches or plantations, according to the species. The blood-vessels going to the horn are very large at the commencement and during its growth, and the extension of the velvet-like membrane is as rapid as the advance of the bone or horn. As soon as the horn attains its full growth the blood-vessels contract and diminish until they cease to convey blood to the velvet membrane, which then dries, loses its sensibility, and gradually flakes off. After the rutting season a slight tumescence occurs at the edge of the peduncle, and the whole horn is at length detached and falls off.

Dental System.

Teeth	12 Upper	0 Incisive		0 False
		0 Canine		0 True Molars.
		12 Molars.		
	20 Lower	8 Incisive		6 False
		0 Canine		6 True Molars.
		12 Molars.		

In the upper jaw the three first molars are bordered by a thick crest at their internal edges; the

* The part commonly used for cane-heads, &c.

two following are formed of two parts, each of which is composed of a single tubercle, having two crests in front, one on the outside, terminating abruptly, the other on the inside, which descends as far as the middle of the height of the tooth, and then rises upwards to rejoin the anterior border of the principal tubercle; between this crest and the tubercle there is a hollow. When the tubercle begins to wear, it exhibits a portion of a narrow circle, bordered by enamel. The last molar differs from the two preceding solely in being somewhat narrower, and in having thinner crescents.

In the lower jaw the first incisor is the largest, the second and third are somewhat less than the other, and the last is very small. They are all trenchant, inclined forwards, and separate themselves slightly from the median line. The two first false molars are simple, the third has a spur at its posterior part, and the three last differ very slightly from each other.

In their reciprocal position the inferior incisors correspond to the superior maxillary bone; the molars are alternate.

The writings of naturalists exhibit great confusion relative to the North American species of deer.—Much of this evil is attributable to the loose manner in which species have been proposed upon the authority of persons unqualified to distinguish between accidental varieties, dependent upon sex or age, and those permanent characteristics indicative of specific constitution.

Cuvier, with his usual acumen and amplitude of research, has turned his attention to this subject,

with great advantage to students of natural history. Though he may not have been the first or only naturalist who knew and discriminated correctly the North American species, he is the first who has displayed his researches in such a manner as will enable every one to satisfy himself of the accuracy of his deductions.* He has admitted the following to be the species now inhabiting this country, all the others named as distinct in the books being mere varieties: *C. Alces*, the Moose; *C. Canadensis*, the American Elk; *C. Tarandus*, the Rein Deer; *C. Virginianus*, the Common Deer.

To this list must be added the *C. Macrotis*, Mule or Black-tail Deer, first indicated by Lewis and Clarke, and described by SAY, under the name just given, in Long's Expedition to the Rocky Mountains.

SPECIES I.—*The Moose.*

Cervus Alces; L.

Alces, Aphlis: PLIN. ALD. GESN. JONST.
Original: CHARLEV. Nouv. France, iii. 125.
Elan: BUFF. Hist. Nat. xii. Supp. vii.
Elk: SHAW, Gen. Zool. ii. pt. 2. 174.
Moose Deer: DUDLEY, Phil. Trans. No. 444. WARDEN, Descript. des Etats Unis, v. p. 636.
Elk: PENN. Hist. Quad. No. 43. *Moose* Id. Arct. Zool. i. No. 8. p. 18.

The Moose† is perhaps the only deer whose general appearance can be called ungraceful, or whose

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* Ossemens Fossiles, nouv. ed. tome iv.

† This appellation is derived from *Musu*, the name given to the animal by the Algonquins.

proportions at first sight impress the beholder unfavorably. Its large head terminates in a square muzzle, having the nostrils curiously slouched over the sides of the mouth; the neck, from which rises a short thick mane, is not longer than the head, which in males is rendered still more cumbrous and unwieldy, by wide palmated horns: under the throat is found an excrescence from which grows a tuft of long hair; the body, which is short and thick, is mounted upon tall legs, and the whole aspect is so unusual that incidental observers are pardonable for considering it ugly. Yet as these singularities of structure have direct or indirect reference to peculiarities of use, an inquiry into the mode of life led by this species, may cause us to forget, in admiration of its adaptation to circumstances, prejudices excited by the comparative inelegance of its form.

The moose inhabits the northern parts of both continents;* on the American it has been found as far north as the country has been fully explored; its southern range, at former periods, extended to the shores of the great lakes and throughout the New England States. At present it is not heard of south of the state of Maine, where it is becoming rare. In Nova Scotia, the isle of Breton, the country adjacent to the bay of Fundy, and throughout the Hudson's Bay possessions, the moose is found in considerable numbers.

The dense forests and closely shaded swamps of

* It is, in Europe, called "Elk."

these regions are the favorite resorts of this animal, as there the most abundant supply of food is to be obtained with the least inconvenience. The length of limb and shortness of neck, which in an open pasture appear so disadvantageous, are here of essential importance, in enabling the moose to crop the buds and young twigs of the birch, maple, or poplar, or should he prefer the aquatic plants, which grow most luxuriantly where the soil is unfit to support other animals, the same length of limb enables him to feed with security and ease. We cannot avoid believing that the peculiar lateral and slouching position of the nostrils is immediately connected with the manner in which the moose browses. Their construction is very muscular, and seems well adapted for seizing and tearing off the twigs and foliage of trees, and conveying them to the mouth; it may also be designed to prevent the sense of smell from being at any time suspended by the prehension of food. The probability of this last suggestion is strengthened by the fact that the moose is endowed with an exquisite sensibility of smell, and can discover the approach of hunters at very great distances. When obliged to feed on level ground, the animal must either kneel or separate the legs very widely; in feeding on the sides of acclivities, the moose does so with less inconvenience by grazing from below upwards: the steeper the ground may be, so much the easier is it for this species to pasture. Yet, whenever food is to be procured from trees and shrubs, it is preferred to that which is only to be obtained by grazing.

The moose, like his kindred species, is a harmless

and peaceful animal, except in the season when the sexes seek each other. Then the males display a fierceness and pugnacity which forms a strong contrast to their ordinary actions; were they examined only during such seasons, the character of the species would be entirely misconceived. Under the influence of this powerful, though temporary excitement, the males battle furiously with each other, and resist the aggressions of man himself with vigour and effect.

In the summer the moose frequents swampy or low grounds near the margins of lakes and rivers, through which they delight to swim, as it frees them for the time from the annoyance of insects. They are also seen wading out from the shores, for the purpose of feeding on the aquatic plants which rise to the surface of the water. At this season they regularly frequent the same place in order to drink, of which circumstance the Indian hunter takes advantage to lie in ambush, and secure the destruction of the deer. At such drinking places as many as eight, or ten pairs of moose horns have been picked up.

During the winter the moose, in families of fifteen or twenty, seek the depths of the forest for shelter and food. Such a herd will range throughout an extent of about five hundred acres, subsisting upon the mosses attached to the trees, or browsing the tender branches of saplings, especially of the tree called moose-wood. The Indians name parts of the forest thus occupied moose-yards.

In Nova-Scotia, New-Brunswick, and the island of Grandmanan, the moose is generally hunted in the

month of March, when the snow is deep, and sufficiently crusted with ice to bear the weight of a dog, not that of a moose, as has been stated. Five or six men, provided with knapsacks, containing food for as many days, and all necessary implements for building their "camp" at night, set out in search of a moose yard. When they have discovered one, they collect their dogs and encamp for the night, in order to be ready to commence the chase at an early hour, before the sun softens the crust upon the snow, which would be the means of retarding the dogs, and facilitating the escape of the deer. At daybreak the dogs are laid on, and the hunters, wearing large snow shoes, follow as closely as possible. As soon as the dogs approach a moose, they assail him on all sides, and force him to attempt his escape by flight. The deer, however, does not run far, before the crust on the snow, through which he breaks at every step, cuts his legs so severely, that the poor animal stands at bay and endeavours to defend himself against the dogs by striking at them with his forefeet. The arrival of the hunter within a convenient distance soon terminates the combat, as a ball from his rifle rarely fails to bring the moose down.

Judging by the rapid diminution of this species within a comparatively few years, it is to be feared that it will, at no great distance of time, be exterminated. The moose is easily tamed, although of a wild and timid disposition; sometimes when taken very young they are domesticated to a remarkable degree. We are informed by our friend Mr. Vanhuskirk, of New-Brunswick, that he knew of one

which was taken, when two days old, by an Indian, and presented to a gentleman in Nova-Scotia. The proprietor allowed it to suck a cow for three months, and afterwards fed it with different vegetables, until it was a year old. This moose displayed a singular animosity against one of the young ladies of the family, and would chase her with fierceness into the house. When the door was closed in time to exclude him, he would immediately turn round and kick violently against it.*

The horns of the moose spread out almost immediately from their base into a broad palmation: in old animals they increase to a great size, and have been known to weigh fifty-six pounds, each horn being thirty-two inches long. The horns are generally cast in the month of November; the Indians employ

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* "In the year 1777, an Indian had two young moose so tame, that, when on his passage to Prince of Wales' fort in a canoe, the moose always followed him along the bank of the river, and at night, or on any other occasion, when the Indians landed, the young moose generally came and fondled on them in the same manner as the most domestic animal would have done, and never offered to stray from the tents. Unfortunately, in crossing a deep bay in one of the lakes, on a fine day, all the Indians that were not interested in the safe landing of those engaging creatures, paddled from point to point; and the man that owned them not caring to go so far about by himself, accompanied the others in hopes they would follow him round as usual. But at night the young moose did not arrive, and as the howling of some wolves was heard in that quarter, it was supposed they had been devoured by them, as they were never afterwards seen." Hearne, 8vo. Ed. p. 258.

them for various purposes, cutting them into spoons, scoops, &c.

When chased, the moose throws his horns towards his neck, elevates his nose, and dashes swiftly into the thickest of the forest; occasionally the horns prove the means of his destruction, by being entangled among vines, or caught between small trees. Where the moose runs over a plain, he moves with great celerity, although his gait is nothing better than a sort of long shambling trot: this, however, is rendered very efficient, by the great length of his limbs. While running in this manner the divisions of the hoofs, which are very long, separate as they press the ground, and close together as they are raised, with a clattering sound, which may be heard to some distance; this circumstance is also remarked in the rein-deer.

Notwithstanding the ease and swiftness of their movements, they would be easily captured, if pursued by horsemen and hounds, in a country adapted to such a chase, as they are both short breathed and tender footed.

The acuteness of their sense of hearing, thought to be that which is possessed by the moose in the greatest degree of perfection, together with the keenness of their smell, renders it very difficult to approach them. The Indians attempt it by creeping among the trees and bushes, always keeping to leeward of the deer. In summer, when they resort to the borders of lakes and rivers, the Indians often kill them while crossing the streams, or when swimming from the shore to the islands. "They are," says HEARNE, "when pursued in this manner, the most inoffensive of all ani-

mals, never making any resistance; and the young ones are so simple, that I remember to have seen an Indian paddle his canoe up to one of them and take it by the poll, without the least opposition: the poor harmless animal seeming, at the same time, as contented alongside the canoe as if swimming by the side of its dam, and looking up in our faces with the same fearless innocence that a house lamb would, making use of its forefoot almost every instant to clear its eyes of musquitoes, which at that time were remarkably numerous."

The flesh of the moose, though generally coarser and tougher than other venison, is esteemed excellent food, and the Indians, hunters and travellers, all declare they can withstand more fatigue while fed on this meat than when using any other. The large and gristly extremity of the nose is accounted an epicurean treat, and the tongue of the animal is also highly praised, notwithstanding it is not commonly so fat and delicate as the tongue of the common deer. As the moose feeds upon the twigs, buds and small branches of the willow, birch poplar, mosses, aquatic plants, &c. its flesh must be peculiarly flavoured. "The fat of the intestines is hard like suet, but all the external fat is soft like that of a breast of mutton, and when put into a bladder is as fine as marrow. In this they differ from all the other species of deer, of which the external fat is as hard as that of the kidneys."* The female moose never has any horns: they bring forth their

* Hearne.

young, "from one to three in number, in the latter end of April or beginning of May."*

The male moose often exceeds the largest horse in size and bulk; the females are much less than the males, and differently coloured. The hair of the male is long and soft like that of a common deer; it is black at tip, but within it is of an ash colour, and at the base pure white. The hair of the female is of a sandy brown colour, and in some places, especially under the throat, belly and flank, is nearly white at tip, and altogether so at base.

The skin of the moose is of great value to the Indians, as it is used for tent covers, clothing, &c. We shall defer the account of the methods of dressing these and other deer skins, until we treat of the common deer, when we shall describe the Indian modes of currying proper to each of these skins.

The moose, like other deer inhabiting the northern regions, is exceedingly annoyed by insects, which not only feast upon its blood, but deposit their eggs in different parts of its body, along the spine, within the cavities of the nose, mouth, &c. These eggs when hatched form large larvæ or maggots, that feed on the parts within which they are placed, until ready to assume their perfect or winged condition, when they perforate the skin and take flight. So great a number of such perforations are made at certain seasons, that the skins of the moose are rendered worthless to the hunter, unless it be for the purpose of cutting them into thongs for nets and other uses.

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* Hearne.

Drawn by Rider.
Engraved by W.E.Tucker
Moose Deer.
Rein Deer.

Species II.—*The Rein-Deer.*

CERVUS TARANDUS; L.

Tarandus: Plin. Hist. Nat. viii. c. 34.
Ælian, Anim. ii. c. 16.
Caribou: Charlev. Nouv. France, iii. p. 129; Dobbs, Hudson's Bay, 20.
Greenland Deer: Catesby's Carolina, App. p. 28.
Renne: Buff. Hist. Nat. xii.
Reinthier, Tharandthier: Gesn. Thierb. p. 206, 209.
Greenland Buck: Edw. Av. 1, tab. 51.
Rein-Deer: Penn. Arct. Zool. Ibid. Quad. p. 46.

This valuable animal is found in great abundance in the northern parts of both continents, and constitutes a very considerable part of the subsistence of the tribes inhabiting the regions it frequents. In the northern parts of Asia and Europe, the rein-deer has been domesticated for a long time, and with the exception of the dog, is the only beast of draught or burthen possessed by the natives. The North American Indians, however, have never profited by the docility of this animal to aid them in transporting their families or property, though they annually destroy great numbers of them for the sake of their flesh, hides, horns, &c.

During the winter they take shelter in the forests, whence they are occasionally induced by the occurrence of a few fine days to pay a short visit to their favourite pastures on the barren grounds, which are covered with a profusion of mosses. Their great movement to the northward commonly begins towards the end of April, when the snow first melts from the sides of the hills; they are found on the banks of the Copper-Mine River early in May, at

which time a considerable extent of ground is free from snow. In this spring migration the females take the lead, and bring forth their young on the sea coast about the end of May or beginning of June. They retire from the sea coast in July and August, but linger in the vicinity of the barren grounds as late as October, whence they seek their winter retreats in the woods.

In their migrations the whole herd frequently amounts to one or two thousand, and is separated into smaller herds, varying in number from ten to a hundred, as chance or their fears may determine them to unite or separate. The Indians have remarked that there are certain places which the rein-deer invariably visit in their migrations to and from the coast, and that they always travel against the wind. In the barren grounds the principal food of this species is the various lichens or mosses; the hay or dry grass found in the swamps during autumn is also eaten, and in the woods the mosses attached to the trees. "They are accustomed to gnaw their fallen antlers, and *are said* also to devour mice."

Some rein deer are never met with except in the woody country, and they are much larger than those which visit the coast. This variety is stated to weigh from 200 to 240lbs., while the weight of the common rein-deer, exclusive of the offal, varies from 90 to 130lbs. The large variety are found to have their skins as much perforated by the larvæ of the gadfly as the others, which is considered as a presumptive proof, by Capt. Franklin, that the smaller deer are not driven to the sea coast and islands of

the Polar sea by the attacks of that insect. A few rein-deer killed in the spring are found to have their skins uninjured, and these are always fat, though all the other deer are lean at the same season.

As we have not had an opportunity either of becoming acquainted with this species in its native wilds, or of seeing any individuals in a state of captivity, we shall here introduce an account from the accurate observations of HEARNE, confirmed by the recent and interesting remarks of Capt. FRANKLIN, given in the narrative of his first and memorable journey to the shores of the Polar sea.

"When the Indians design to impound deer, they look out for one of the paths in which a number of them have trod, and which is observed to be still frequented by them. When these paths cross a lake, a wide river, or a barren plain, they are found to be much the best for the purpose; and if the path run through a cluster of woods, capable of affording materials for building the pound, it adds considerably to the commodiousness of the situation. The pound is built by making a strong fence of brushy trees, without observing any degree of regularity, and the work is continued to any extent, according to the pleasure of the builders. I have seen some that were not less than a mile round, and am informed that there are others still more extensive. The door or entrance of the pound is not larger than a common gate, and the inside is so crowded with small counter hedges as very much to resemble a maze; in every opening of which they set a snare made with thongs of parchment, deer skins, &c. twisted together, which are amazingly strong. One end of the

snare is usually made fast to a growing pole; but if no one of sufficient size can be found near the place where the snare is set, a loose pole is substituted, which is always of such size and length, that a deer cannot drag it far before it gets entangled among the other woods which are all left standing, except what is found necessary for making the fence, hedges, &c.

"The pound being thus prepared, a row of small brushwood is stuck up in the snow on each side the door or entrance, and these hedgerows are continued along the open part of the lake, river or plain, where neither stick nor stump besides is to be seen. These poles or brushwood are generally placed at the distance of fifteen or twenty yards from each other, and ranged in such a manner as to form two sides of a long acute angle, growing gradually wider in proportion to the dimensions of the pound, which is sometimes not less than two or three miles, while the deer path is exactly along the middle, between the two rows of brushwood.

"Indians employed on this service always pitch their tent on or near to an eminence that affords a commanding prospect of the path leading to a pound; and when they see any deer going that way, men, women and children, walk along the lake or river side, under cover of the woods, until they get behind them, then step forth to open view, and proceed towards the pound in the form of a crescent. The poor timorous deer finding themselves pursued, and at the same time taking the two rows of bushy poles to be two ranks of people stationed to prevent their passing on either side, run straight forward in

the path till they get into the pound. The Indians then close in, and block up the entrance with some brushy trees that have been cut down and lie at hand for that purpose. The deer being thus enclosed, the women and children walk round the pound to prevent them from jumping over the fence, while the men are employed in spearing such as are entangled in the snares, and shooting with bows and arrows those which remain loose in the pound. This method of hunting, if it deserves the name, is sometime so successful that many families subsist by it without having occasion to remove their tents above once or twice during the whole course of a winter; and when the spring advances both the deer and Indians draw out to the eastward, on the ground which is entirely barren, or at least what is so called in those parts, as it neither produces trees nor shrubs of any kind, so that moss, and some little grass, is all the herbage to be found on it.

"The great destruction of the deer in the month of August, for the sake of their skins, which are then fittest for use, is almost incredible; and as they are never known to have more than one fawn at a time, it is wonderful they do not become scarce. But so far is this from being the case, that the oldest northern Indian will affirm, that the deer are as plentiful now as they ever have been; and though they are remarkably scarce some years near Churchhill river, yet it is said, and with great probability of truth, that they are more numerous in other parts of the country than they were formerly. The scarcity or abundance of these animals in different places at the same season, is caused in a great measure, by

the winds which prevail for some time before; for the deer are supposed by the natives to walk always in the direction from which the wind blows, except when they migrate from east to west, or from west to east, in search of the opposite sex.

"It requires the prime parts of from eight to ten deer skins to make a complete suit of warm clothing for a grown person during the winter; all of which should, if possible, be killed in the month of August or early in September, for after that time the hair is too long, and at the same time so loose in the pelt, that it will drop off with the slightest injury. Besides these skins, which must be in the hair, each person requires several others to be dressed into leather, for stockings and shoes and light summer clothing. Several more are also wanted in a parchment state to make *clewla*, as they call it, or thongs for the nettings of snow-shoes, snares for deer, sewing for their sledges, and in fact for every other use where strings or lines of any kind are required; so that each person on an average expends, in the course of a year, upwards of twenty deer skins in clothing and other domestic uses, exclusive of tent cloths, bags, and many other things. All skins for the above-mentioned purposes are, if possible, procured between the beginning of August and the middle of October; for when the rutting season is over, and the winter sets in, the deer skins are not only very thin, but in general full of worms and warbles, which render them of little use, except for thongs. Indeed, the chief use that is made of them in winter is for the purpose of food; and really, when the hair is properly taken off, and all the warbles are squeezed

out, if they are well boiled they are far from being disagreeable. The Indians, however, never could persuade me to eat the warbles, (maggots of the gad-fly,) of which some of them are remarkably fond, particularly the children. They are always eaten raw and alive out of the skin, and are said by those who like them to be as fine as gooseberries. But the very idea of eating such things, exclusive of their appearance, (many of them being as large as the first joint of the little finger,) was quite sufficient to give me an unalterable disgust to such a repast.

"The month of October is the rutting season with these deer, and after the time of their courtship is over the bucks separate from the does: the former proceed to the westward, to take shelter in the woods during the winter, and the does keep out in the barren ground the whole year. This, though a general rule, is not without some exceptions, for I have frequently seen many does in the woods, though they bore no proportion to the bucks. This rule, therefore, only stands good respecting the deer to the north of Churchill river, for the deer to the southward live promiscuously among the woods as well as in the plains, and along the banks of the rivers, lakes, &c. the whole year.

"The old buck's horns are very large, with many branches, and always drop off in the month of November, which is the time they begin to approach the woods. This is undoubtedly wisely ordered by Providence, the better to enable them to escape from their enemies through the woods, otherwise they would become an easy prey to wolves and other

beasts, and be liable to get entangled among the trees, even in ranging about in search of food. The young bucks in those parts do not shed their horns as soon as the old ones; I have frequently seen them killed at or near Christmas, and could discover no appearance of their horns being loose. The does do not shed their horns till the summer, so that when the buck's horns are ready to drop off, the horns of the doe are all hairy, and scarcely come to their full growth."*

"The haunches of the male rein-deer, in the beginning of the month of October, are covered to the depth of two inches or more with fat, which is beginning to get red and high flavoured, and is considered as a sure indication of the commencement of the rutting season. Their horns, which in the middle of August were yet tender, have now attained their proper size, and are beginning to lose their hairy covering, which hangs from them in ragged filaments. The horns of the rein-deer vary not only with its age and sex, but are otherwise so uncertain in their growth, that they are never alike in any two individuals. The old males shed theirs about the end of December; the females retain them until the disappearance of the snow enables them to frequent the barren grounds, which may be stated to be about the middle or end of May, soon after which period they proceed towards the sea coast and drop their young. The young males lose their horns about the same time with the females, or a little earlier, some of them as early as April. The hair of

* Hearne, passim. 8vo. Ed.

the rein-deer falls in July, and is succeeded by a short thick coat of mingled clove, deep reddish and yellowish browns—the belly and under parts of the neck, &c. remaining white. As the winter approaches, the hair becomes longer and lighter in its colours, and it begins to loosen in May, being then much worn on the sides from the animal rubbing itself against trees and stones. It becomes grayish and almost white before it is completely shed. The Indians form their robes of the skins procured in autumn, when the hair is short. Towards the spring the larvæ of the œstrus, attaining a large size, produce so many perforations in the skins that they are good for nothing. The cicatrices only of these holes are to be seen in August, but a fresh set of ova have in the mean time been deposited.*

"The herds of deer are attended in their migrations by bands of wolves, which destroy a great many of them. The Copper Indians kill the rein-deer in summer with the gun, or taking advantage of a favourable disposition of the ground, they enclose a herd upon a neck of land and drive them into a lake, where they fall an easy prey; but in the rutting season, and in the spring, when they are numerous on the skirts of the woods, they catch them in snares.

* "It is worthy of remark, that in the month of May a very great number of large larvæ exist under the mucous membrane at the root of the tongue and posterior part of the nares and pharynx. The Indians consider them to belong to the same species with the œstrus that deposits its ova under the skin; to us the larvæ of the former appeared more flattened than those of the latter."—*Dr. Richardson's Journal.*

The snares are simple nooses formed in a rope made of twisted sinew, which are placed in the aperture of a slight hedge, constructed of the branches of trees. This hedge is disposed so as to form several winding compartments,—and although it is by no means strong, yet the deer seldom attempt to break through it. The herd is led into the labyrinth by two converging rows of poles, and one is generally caught at each of the openings by the noose placed there. The hunter, too, lying in ambush, stabs some of them with his bayonet as they pass by, and the whole herd frequently becomes his prey. Where wood is scarce, a piece of turf turned up answers the purpose of a pole to conduct them towards the snares. The rein-deer has a quick eye, but the hunter, by keeping to leeward, and using a little caution, may approach very near, their apprehensions being much more easily aroused by the smell than the sight of any unusual object. Indeed, their curiosity often causes them to come close up and wheel round the hunter, thus affording him a good opportunity of singling out the fattest of the herd, and upon these occasions they often become so confused by the shouts and gestures of their enemy, that they run backwards and forwards with great rapidity, but without the power of making their escape. The Copper Indians find that a white dress attracts the most readily, and they often succeed in bringing them within gun shot, by kneeling and vibrating the gun from side to side, in imitation of the motions of a deer's horns when he is in the act of rubbing his head against a stone.

"The Dogrib Indians have a mode of killing these animals which, though simple, is very successful. It was thus described by Mr. Wentzel, who resided long amongst that people. The hunters go in pairs, the foremost man carrying in one hand the horns and part of the skin of the head of a deer, and in the other a small bundle of twigs, against which he, from time to time, rubs the horns, imitating the gestures peculiar to the animal. His comrade follows, treading exactly in his footsteps, and holding the guns of both in a horizontal position, so that the muzzles project under the arms of him who carries the head. Both hunters have a fillet of white skin round their foreheads, and the foremost has a strip of the same kind around his wrists. They approach the herd by degrees, raising their legs very slowly, but setting them down somewhat suddenly, after the manner of a deer, and always taking care to lift their right or left feet simultaneously. If any of the herd leave off feeding to gaze upon this extraordinary phenomenon, it instantly stops, and the head begins to play its part by licking its shoulders, and performing other necessary movements. In this way the hunters attain the very centre of the herd without exciting suspicion, and have leisure to single out the fattest. The hindmost man then pushes forward his comrade's gun, the head is dropt, and they both fire nearly at the same instant. The herd scampers off, the hunters trot after them; in a short time the poor animals halt to ascertain the cause of their terror, their foes stop at the same instant, and having loaded as they ran, greet the gazers with a second fatal discharge. The consternation of the deer increases,

they run to and fro in the utmost confusion, and sometimes a great part of the herd is destroyed within the space of a few hundred yards."*

Species III.—*The Elk.*

Cervus Canadensis; Briss.

Cerf du Canada: Perrault, Mem. sur les Anim. ii. 45.
Cervus Major Americanus: Catesby, Carol. app. ii. 28.
Cervus Strongyloceros: Schreb. Saeugthiere.
Alces Americanus, cornibus teretibus: Jefferson, Virginia, 96.
The Elk: Lawson, New Voyage; Carver, Travels, 417.
The American Elk: Bewick, Quadrupeds, 112.
Cervus Wapiti: Barton, Med. and Physical Journ. iii. 36.
Wapiti: Warden, Descr. des Etats Unis, v. 368; Stag, Red Deer, Ibid. 367. *Wapiti*, Mitchill, Leach. Fred Cuvier, Mammif. Lithogr. liv. 21e.
Cerf Wapiti: Desm. Mamm. Sp. 664; Cerf Canadien, Ibid. Sp. 665.
Wewaskish [*Waskesse; Wawashkeesho*] Hearne, Journey, &c. 360.

[*Commonly called Stag, Red Deer, Gray Moose, Le Biche, Wapiti, American Elk, Round horn Elk, Elk, &c.*]

The stately and beautiful animal we are now to describe has been until very recently confounded with other species of deer, to which it bears but a slight resemblance, and from which it is distinguished by the most striking characters. The English name by which it is commonly known, and which we prefer to others, is the same as that given to the moose in Europe; hence this species was for a long time considered as a mere variety of the moose, if

* Franklin's Narrative of a Journey to the shores of the Polar Sea.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

Drawn by C.A.Le Sueur. Engd by G.B.Ellis.

Elk.

1. Horns of the Animal in his 7th year. 2. Young horns in his 8th year

not identically the same. A general resemblance to the European stag caused the application of the same name to our elk, and this circumstance led various writers into the error of considering our animal to be a variety of the *Cervus Elaphus*, or common stag of Europe. A reference to the synonymy we have prefixed to this article, will amply suffice to show how great a degree of confusion has hitherto existed upon this subject; a confusion rather increased than diminished by those who have attempted its removal by reconciling the discrepances of books instead of appealing to the proper and infallible authority, nature.

Hearne we believe to be justly entitled to the credit of having insisted upon the specific distinctness of this animal from the moose, by pointing out the error into which Pennant had fallen, in stating the Waskesse or Wewaskish to be of the same species. The description he gives of the Wewaskish sufficiently proves that it was our elk he described, and the characters he enumerates satisfactorily establish the specific differences between this animal and the moose.

Jefferson, in his valuable notes on Virginia, without being aware of Hearne's observations, proves very clearly that the elk of America ought to be regarded as identical neither with the moose nor stag of Europe, and proposed for our animal the name of *Alces Americanus*. Subsequently Dr. E. H. Smith published a very interesting paper in the New York Medical Repository, in which he described three individuals of this species, and gave a still more com-

plete enumeration of their distinctive characters and history.

It would be as unprofitable as irksome to enter more extensively into the history of the different errors and changes respecting the classification of this deer. To us it appears sufficient to declare it to be now fully established that there is but *one* species of American Elk, upon which all the names prefixed, scientific and trivial, have been bestowed; that this species is second in size to the moose alone, and that in beauty of form, grace and agility of movement, and other attributes of its kind, it is not excelled by any deer of the old or new world.

The size and appearance of the elk are imposing; his air denotes confidence of great strength, while his towering horns exhibit weapons capable of doing much injury when offensively employed. The head is beautifully formed, tapering to a narrow point; the ears are large and rapidly moveable; the eyes are full and dark; the horns rise loftily from the front, with numerous sharp pointed branches, which are curved forwards, and the head is sustained upon a neck at once slender, vigorous and graceful. The beauty of the male elk is still farther heightened by the long forward-curling hair, which forms a sort of ruff or beard, extending from the head towards the breast, where it grows short and is but little different from the common covering. The body of the elk, though large, is finely proportioned; the limbs are small, and apparently delicate, but are strong, sinewy and agile. The hair is of a blueish gray colour in autumn; during winter it continues of a dark gray

and at the approach of spring it assumes a reddish or bright brown colour, which is permanent throughout summer. The croupe is of a pale yellowish white or clay colour, and this colour extends about the tail for six or seven inches, and is almost uniformly found in both sexes. There is no very perceptible difference of colour between the male and female.

The female, however, does not participate in the "branching honours" of the male, which are found to attain, in numerous instances, a surprizing magnitude. It is not uncommon to see them of four and five feet in height, and it is said that they are sometimes still higher. Specimens of the largest size may be seen in the cabinets of the Philadelphia Museum, and of the Lyceum of Natural History of New York. These horns are said to consist of three principal divisions; 1st, The brow antlers, sometimes called "alters" by the hunters. 2d, The two middle prongs, named "fighting horns," and, 3d, The shaft or proper horns. The branches just mentioned are always placed on the front, outside, or posterior surface, never on the inner side of the horns, a circumstance which has been indicated as strikingly different from the arrangement of the branches of the horns of the common or Virginian deer, hereafter to be described.

The elk sheds his horns about the end of February or beginning of March, and such is the rapidity with which the new horns shoot forth, that in less than a month they are a foot in length. The whole surface of the horn is covered by a soft hairy membrane, which, from its resemblance to that sub-

stance, is called *velvet*, and the horns are said to be "in the velvet" until the month of August, by which time they have attained their full size.—After the horns are entirely formed, the membrane becomes gradually detached, and this separation is hastened by the animal, who appears to suffer some irritation, or itching, which causes him to rub the horns against trees, &c.

Almost all those who have written on this species, have dwelt upon the peculiar apparatus, situated beneath the eye, at the internal angle, which the French naturalists call *larmiers*, or sinus lacrymales. This apparatus is a slit, or depression, obliquely placed below the inner angle of each eye, and lined with a naked membrane, which secretes an unctuous matter, not unlike the cerumen or wax of the ear. Dr. SMITH, in the paper we have above referred to, says that "the hunters assure us that the elk possesses the power, by strictly closing the nostrils, of forcing the air through these apertures in such a manner as to make a noise which may be heard at a great distance." This, however, is inaccurate; it is true that the elk, when alarmed, or his attention is strongly excited, makes a whistling noise at the moment that these lacrymal appendages are opened and vibrated in a peculiar manner. But having dissected these appendages in an elk, recently dead, we are perfectly assured that there is no communication between the nostril of the animal and these sacs. The bone behind these appendages is cribriform, or reticular, but we could discover no duct nor passage by which air or any fluid could find its way. The peculiar use and importance of this

structure is still unknown; it exists in several species of the genus, as already indicated in the generic characters, and nothing but a close and careful examination of these animals in a state of nature will lead us to a correct understanding of their purpose. BARTON's notion, that "it seems in these animals to serve the purposes of an auxiliary breathing apparatus, and of an organ of smelling," is altogether speculation, founded upon a "*conjecture*," as to the structure of the sac and its connexion with the nostrils.

The elk has at one period ranged over the greater part, if not the whole, of this continent. JEFFERSON has stated that he "could never learn that the round-horned elk has been seen farther north than the Hudson river." But HEARNE has described the wewaskish in such a manner, as to leave no doubt of its existence as far north as the vicinity of Cumberland House, in lat. 53° 56'.*

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* "The we-was-kish, or as some (though improperly) call it, the waskesse, is quite a different animal from the moose, being by no means so large in size. The horns of the wewaskish are *something similar* to those of the common deer [the *Rein Deer;* he distinguishes the common deer *C. Virginianus* (of the United States) as indian deer,] but are *not palmated* in any part. They stand more upright, have fewer branches, and want the brow antler. The head of this animal is so far from being like that of the moose, that the nose is sharp like that of a sheep. The hair is usually of a sandy red, and they are frequently called by the English who visit the interior parts of the country, red deer.—The person who informed Mr. PENNANT that the wewaskish and moose are the same animal, never saw one of them; and the only reason he had to suppose it, was the great resemblance of their skins." p. 360-1-2.

Elk are still occasionally found in the remote and thinly settled parts of Pennsylvania, but the number is small; it is only in the western wilds that they are seen in considerable herds. They are fond of the great forests, where a luxuriant vegetation affords them an abundant supply of buds and tender twigs; or of the great plains, where the solitude is seldom interrupted, and all bounteous nature spreads an immense field of verdure for their support.

The Elk is shy and retiring; having acute senses, he receives early warning of the approach of any human intruder. The moment the air is tainted by the odour of his enemy, his head is erected with spirit, his ears rapidly thrown in every direction to catch the sounds, and his large dark glistening eye expresses the most eager attention. Soon as the approaching hunter is fairly discovered, the elk bounds along for a few paces, as if trying his strength for flight, stops, turns half round, and scans his pursuer with a steady gaze, then, throwing back his lofty horns upon his neck, and projecting his taper nose forwards, he springs from the ground and advances with a velocity which soon leaves the object of his dread far out of sight.

But in the season when sexual passion reigns with its wonted influence over the animal creation, the elk, like various other creatures, assumes a more warlike and threatening character. He is neither so easily put to flight, nor can he be approached with impunity, although he may have been wounded. His horns and hoofs are then employed with great effect, and the lives of men and dogs are endangered by coming within his reach. This season is during August and September, when

the horns are in perfect order, and the males appear filled with rage, and wage the fiercest war with each other for the possession of the females. During this season the males are said to make a loud and unpleasant noise, which is compared to a sound between the neighing of a stallion and the bellowing of a bull. Towards the end of May or the beginning of June, the female brings forth her young, commonly one, but very frequently two in number, which are generally male and female.

The flesh of the elk is highly esteemed by the Indians and hunters as food, and the horns, while in their soft state, are also considered a delicacy; of their hides a great variety of articles of dress and usefulness are prepared. The solid portion or shaft of the perfect horn is wrought by the Indians into a bow, which is highly serviceable from its elasticity, as well as susceptible of beauty of polish and form. Several of these bows may be seen in the extensive collection of Indian implements belonging to the Philadelphia Museum.*

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* In a work devoted to the natural history of our country, a passing tribute to the memory of one who has done much for natural science, will not, we hope, be regarded as obtrusive.

But a few weeks have elapsed since the great debt of nature was paid by Charles Wilson Peale, the founder of the Philadelphia Museum. If a long life, devoted with singular enthusiasm to the advancement of natural history, by the collection of objects in all the departments of natural science, be meritorious; if the establishment of an institution which has long been the pride, and promises hereafter to be an honour and ornament to our country, be valuable; if eigh-

The elk has occasionally been to a certain degree domesticated, and might possibly be rendered as serviceable as the rein-deer. A pair of these animals, represented in London under the name of Wapiti, were trained to draw in harness, or to bear the saddle, for the amusement of visitors. But these experiments are not sufficient to lead us to conclude, that the elk could be readily substituted for the rein-deer or horse.

With what little is known of this species from actual observation, several writers have mingled a great deal of fable, and have repeated the stories of "hunters" until they have at length passed for the truth. Thus we are told of "a small vesicle (on the outside of the elk's hind legs) that contains

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ty-six years spent with unblemished integrity and consistency of character in the service of his friends and country, be worthy of respect, the memory of this good man will long continue to be dear to those who are capable of admiring unostentatious virtue, and appreciating the benefits which have already resulted, and will continue to flow from his labours. To the last moment of his existence he exemplified in the fullest degree the excellent effects of a temperate and industrious life; and in the benevolence of his disposition, the undisturbed serenity of his mind, and the unimpaired vigour of his intellect, showed how far the study of nature, in her curious and wonderful works, had refined and ennobled a mind which owed nothing to early education. To him death presented no terrors, for he had long considered it as the termination of his toils; he looked upon the grave but as the place in which he might yield his mortality to the beneficent source whence he sprung; and at peace with all mankind, he gently breathed his last, in cheering confidence of the mercy of the Most High. May he rest in peace!

a thin unctuous matter, which some of our hunters call the "oil." Various improbable uses are assigned to this unique and wonderful "oil spring," which it would be lost time to repeat or refute. We have inquired of those who have dissected several of these animals, and have been present at the dissection of one ourselves, but have never been able to discover any thing of this "vesicle." A friend who had one of these animals for several years living in his possession, states, that he never detected the presence of any such apparatus or oil. Until better proof be given than has yet been offered, we shall feel willing to rank this story among the "conjectures" which have been too often resorted to when there was a scarcity or difficulty of obtaining "facts."

We have already adverted to the warlike disposition of the elk during a particular season, but it may not be amiss to add, that at all times this animal appears to be more ready to attack with his horns than any other species of deer we have examined. When at bay, and especially if slightly wounded, he fights with great eagerness, as if resolved to be revenged. The following instance from Long's Expedition to the Rocky Mountains will, in some degree, illustrate this statement.

A herd of twenty or thirty elk were seen at no great distance from the party, standing in the water or lying upon the sand beach. One of the finest bucks was singled out by a hunter, who fired upon him, whereupon the whole herd plunged into the thicket and disappeared. Relying upon the skill of the hunter, and confident that his shot was fatal, several of the party dismounted and pursued the elk

into the woods, where the wounded buck was soon overtaken. Finding his pursuers close upon him, the elk turned furiously upon the foremost, who only saved himself by springing into a thicket, which was impassable to the elk, whose enormous antlers becoming so entangled in the vines as to be covered to their tips, he was held fast and blindfolded, and was despatched by repeated bullets and stabs.

Species IV.—*The Black-tail Deer.*

Cervus Macrotis; Say.

The Black-tailed Fallow Deer: Lewis and Clarke, i. p. 30. *Mule Deer:* Ibid. ii. 166.
Cervus Auritus: Warden, Descr. des Etats'Unis, v. 640.
Cervus Macrotis: Say, Long's Exped. to the Rocky Mountains, ii. 88.

[*Commonly called Mule Deer.*]

The first indication of this fine deer was given by Lewis and Clarke, who found it upon the sea coast and the plains of the Missouri, as well as upon the borders of the Kooskoose river, in the vicinity of the rocky mountains. They inform us that the habits of this animal are similar to those of its kindred species, except that it does not run at full speed, but bounds along, raising every foot from the ground at the same time. It is found sometimes in the woodlands, but most frequently is met with in prairies and

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* We avoid this name because it leads to an incorrect notion of the animal. The resemblance of its ears to those of the mule gave origin to the name.

in open grounds. Its size is rather greater than that of the common deer, (*C. Virginianus*) but its flesh is considered inferior to the flesh of that species.

According to SAY'S description, the horns are slightly grooved and tuberculated at base, having a small branch near thereto, resembling in situation and direction the first branch on the horn of the common deer. The front line of the antler is curved like that of the common deer, but not to so great a degree, and at about the middle of the entire length of the antlers they bifurcate equally, each of these processes again dividing near the extremity, the posterior being somewhat the shortest.

The ears are very long, being half the length of the whole antler, and extending to its principal bifurcation. The eye is larger than that of the common deer, and the subocular sinus is much larger. The hair is coarser, undulated and compressed, resembling that of the elk, (*C. Canadensis*) and is of a light reddish brown colour above. The sides of the hair on the front of the nose is of a dull ash colour; that on the back is intermixed with blackish tipped hairs, which form a distinct line on the neck, near the head. The tail is of a pale reddish ash colour, except at the extremity on its superior surface, where it is of a jetty black; beneath it is white, yet nearly destitute of hair. The hoofs are shorter and wider than those of the common deer, and more like those of the elk.*

* The following measurements are given by SAY in the work above quoted.

Length from the base of the antlers to the origin of the na-

Species V.—*The Common Deer.*

Cervus Virginianus.

Fallow Deer: Catesby, App. ii. 28: Lawson, Carol. 123.
Cariacu Femelle: Buff. 12, pl. 44.
Cerf de la Louisiane: C. Ossem. Foss. et Regne Anim. Fred. Cuv. Mammif. Lithogr. 4 fig.
Virginian Deer: Pennant, Quad.
Cerf de Virginie: Desm. Mammal. sp. 679, p. 442.

The Common Deer is the smallest American species at present known, and is found throughout the country between Canada in the north and the banks of the Orinoco in South America. In various parts of this extensive range, considerable varieties in size and colouring are presented by this species, though these being accidental and mutable, require no especial description.

The common deer is more remarkable for general slenderness and delicacy of form, than for size and vigour. The slightness and length of its limbs, small body, long and slim neck, sustaining a narrow and

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sal process, two inches. Of the nasal process, two and a-half. From the nasal process to the principal bifurcation, four to five. Thence to the other two bifurcations, respectively, four and a-half to five and a-half. Terminal prongs of the anterior branch, four to four and a-half. Of the posterior branch, two and a-half to three. From the anterior base of the antlers to the tip of the upper jaw, nine and a quarter. From the anterior canthus of the eye to the tip of the jaw, six and a quarter. From the base of the antler to the anterior canthus, three. Of the ears, more than seven and a-half. Of the trunk of the tail, four. Of the hair at the tip of the tail, from three to four.

Virginia or Fallow Deer, Male.

C. A. Lesueur Del. *F. Kearny Sc.*

Fallow Deer, Female.

almost pointed head, give the animal an air of feebleness, the impression of which is only to be counteracted by observing the animated eye, the agile and playful movements, and admirable celerity of its course when its full speed is exerted. Then all that can be imagined of grace and swiftness of motion, joined with strength sufficient to continue a long career, may be realized.

The common deer has always been of great importance to the aborigines of America, as an abundant source of food and raiment, nor has its value been less to the pioneers of civilization in their advances into the untrodden solitudes of the west. The improvements in agriculture have long since rendered this supply of food of comparatively little value to the white man, yet vast numbers of this species are annually destroyed, equally for the sake of their flesh, hides and horns. Judging by the quantity of skins brought to our markets, and calculating the average number of common deer destroyed during the time which has elapsed since the settlement of the country, we may form an imperfect notion of the aggregate number and productiveness of this species; which, notwithstanding this extensive consumption, does not appear to be very rapidly diminishing, if we except the immediate vicinities of very thickly peopled districts. Even in these, where the destruction of deer during the breeding season is prevented by law, the increase seems quite equal to the demand, and such humane and judicious provisions will probably preserve this beautiful race to adorn the forest long after the species is exterminated in situations where it is not thus protected.

The common deer is possessed of keen senses, especially of hearing and smelling; the sight, though good, does not appear to equal in power the senses just named, upon which the safety of the animal most immediately depends.

It is therefore necessary for the hunter to approach the deer against the wind, otherwise he is discovered by the scent. at a great distance, and his objects are entirely frustrated. The slightest noise excites the attention of the deer, and his fears appear to be more readily awakened by this cause than any other; while, on the contrary, the sight of unaccustomed objects seems rather to arouse curiosity than to produce terror, as the animal will frequently approach, or stand gazing intently, until the hunter steals close enough to fire with fatal aim.

The deer, in herds of various numbers, frequent the forests and plains adjacent to the rivers, feeding principally upon the buds and twigs of trees and shrubs, though they are fond of grass when their favourite food is not more convenient. The herd is led by one of the largest and strongest bucks, who appears to watch over the general safety, and leads the way on all occasions. When any cause of alarm checks their progress, the leader stamps with his feet, threatens with his horns, and snorts so loudly as to be heard for a very considerable distance. So long as he stands fast, or prepares for combat, the rest of the herd appear to feel secure; but when he gives way they all follow with precipitation, and vie with each other in the race.

The salines, or licks, as they are commonly called, are eagerly sought for by these deer, as they have

an equal fondness for salt with most other animals belonging to the same order. In licking the soil, through which the saline matter oozes to the surface, they take up very considerable quantities of the earthy matter, and this enables the hunter to discover when the deer have recently visited the spot, or that one of these places is not far distant, as the excrement of the animal then resembles small balls or pellets of hardened clay. The watchfulness of the leader of the herd, as above mentioned, has led the hunters to form an opinion, to which they pertinaciously adhere, that the deer, when they visit a salt lick, always post one of their number as a sentinel, who is to give the alarm in case of the approach of an enemy.

The common deer when startled from a resting place without being much alarmed, moves at first in a singular and amusing manner. With an apparent awkwardness, two or three springs are made, from which the animal alights on three feet, drawing up and extending the limbs in a stiff and peculiar manner. As the tail is erected this alternate resting upon the feet of opposite sides, causes the tail to describe a semicircle from side to side; a few high bounds are next made forwards, as if with a view to prepare for subsequent exertion, and then, if the cause of alarm be continued, the deer exerts his strength and dashes off in his swiftest career.

Although the common deer is generally a very shy and timid animal, the males are very much disposed to war with each other during the season of their sexual passion, and they are almost always inclined to fight when wounded or brought to bay.

At this time they fight with their forefeet as well as their horns, and inflict severe wounds by leaping forward and striking with the edges of their hoofs held together. If a hunter falls on the ground in attempting to close in and despatch a wounded deer with his knife, he is in great danger of being killed by such blows as we have described. This deer is also said by the hunters to evince a very strong degree of animosity towards serpents, and especially to the rattlesnake, of which it has an instinctive horror. In order to destroy one of these creatures, the deer makes a bound into the air, and alights upon the snake with all four feet brought together in a square, and these violent blows are rapidly repeated until the hated reptile is destroyed. The combats in which the males engage with each other are frequently destructive of the lives of both, in a way that would not readily be anticipated. In assaulting each other furiously, their horns come into contact, and being elastic, they yield mutually to the shock, so that the horns of one animal pass within those of the other and thus secure them, front to front, in such a manner that neither can escape, and they torment themselves in fruitless struggles until worn down by hunger, they perish, or become the prey of wolves or other animals. Heads of deer which have thus perished are frequently found, and there is scarcely a museum in this country which has not one or more specimens. The following instance is given by Say in Long's Expedition to the Rocky Mountains. "As the party were descending a ridge, their attention was called to an unusual noise proceeding from a copse of low bushes, a few rods from the path. On

arriving at the spot they found two buck deer, their horns fast interlocked with each other, and both much spent with fatigue, one in particular being so much exhausted as to be unable to stand. Perceiving that it would be impossible that they should extricate themselves, and must either linger in their present situations or die of hunger, or be destroyed by the wolves, they despatched them with their knives, after having made an unavailing attempt to disentangle them. Beyond doubt many of these animals must annually thus perish."

The common deer is fattest and in best condition in the months of October and November, when the rutting season commences, and continues about a month, terminating commonly about the middle of December. While this season continues, the neck of the male is enlarged or dilated.

The female commonly has one or two, and sometimes three* fawns, which are of a light cinnamon colour, spotted with white. While the fawns are still young, or from May until July, the doe very carefully conceals her offspring while she goes to feed; and this act of maternal fondness is not only done in a state of nature, but even when the common deer have been captive for some time and breed in parks. The hunters, however, turn this fondness to their own account, by imitating the cry of the fawn, either by the voice alone, or by a sort of pipe or

* "About the middle of March Mr. Peale shot a large doe, in the matrix of which were three perfectly formed young, of the size of rabbits." Long's Exped. to the Rocky Mountains. i.

reed which closely resembles the bleating of the animal. The parent soon relinquishes all fears for her own safety, in her desire to assist her offspring, and following the sound, approaches the ambush of the hunter, where a deadly shot insures her immediate destruction. When a doe is killed in company with her fawn, or the mother has been removed as above mentioned, the little animal is at once tamed, or exhibits no apprehension at the approach of man, but follows his captor with the most confiding simplicity, and soon becomes so attached to his feeder as to attend his steps at all times, and obey his voice.*

In the latter part of the summer the fawn loses the white spots, and in winter the hair grows longer and grayish, when the animal is said by the hunters to be *in the gray*. To this coat one of a reddish colour succeeds about the end of May and beginning of June; the deer is then said to be *in the red*. Towards the end of August, the old bucks begin to change to the dark bluish colour; the doe begins this change a week or two later, when they are said to be *in the blue*. This coat gradually lengthens until it finally returns to the gray. The skin is said to

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* "From Capt. Parry I learned an interesting anecdote of a doe and her fawn, which he had pursued across a small inlet. The mother, finding her young one could not swim so fast as herself, was observed to stop repeatedly, so as to allow the fawn to come up with her, and having landed first, stood watching it with trembling anxiety as the boat chased it to the shore. She was repeatedly fired at, but remained immoveable, until her offspring landed in safety when they both cantered out of sight."—*Lyon's Narrative*, p. 80.

be toughest in the red, thickest in the blue, and thinnest in the gray; the blue skin is most valuable.*

In the month of January the males cast their horns; the new horns soon after commence their growth. They continue in the velvet until the end of September or beginning of October, so as to be in full condition for battle during their season of love and war. These horns are not very large, but are curved forwards in a peculiar manner. They have an antler placed high up on the inside of each shaft, which presents downwards, and two or three others on the posterior surface, turning backwards. In the fifth year, the horns consist of two cylindrical, whitish, and moderately smooth, shafts, separating at first slightly outwards and backwards, and then strongly curving forwards and downwards. From the second to the fifth year the variations of the horns consist in their gradual advance from single, slightly curved shoots, to three and four antlers.

From what has been already said of the changes occurring at different seasons, it will be perceived that no description of the pelage of any one can be generally applicable. It may be stated that the colour of the adults in summer is a fine fawn or yellowish brown above, with the under part of the lower jaw, throat, belly, lower part of the limbs, posterior edges of the fore-limbs, anterior part of the

* See Say, in Long's Expedition to the Rocky Mountains, i. p. 104.

thighs, and inferior surface of the tail, white. The front is rather gray, while the end of the muzzle is of a deep brown, with two white spots upon the upper lip; on the sides of the lower jaw, at the angles of the mouth, two triangular black spots are very generally found. Two thirds of the upper surface of the tail is light brown, the outer third is black.

The total length of the common deer, exclusive of the hair at the tip of the tail, is five feet four or five inches. The tail, exclusive of the hair, is nine inches and a-half long. The hind foot, from the tip of the os calcis to the extremity of the toe, is sixteen inches and a-quarter. The fore arm eleven inches and seven-eighths. The weight, in the month of February, was 115 lbs.*

During the stay of Long's Expedition at Engineer Cantonment, three specimens of a variety of the common deer were brought in, having all the feet white near the hoofs, and extending to them on the hind part from a little above the spurious hoofs. This white extremity was divided upon the sides of the foot by the general colour of the leg, which extends down near to the hoof, leaving a white triangle in front, of which the point was elevated rather higher than the spurious hoofs. The black mark upon the lower lip, rather behind the middle of the sides, was strongly marked.

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* Say. Lewis and Clarke state that they saw common deer with tails seventeen inches in length.

The flesh of the common deer is justly esteemed as an excellent article of food, when killed in the proper season, which is the autumn. The Indians and hunters, whose necessities do not permit them to choose, feed upon these deer at all seasons. The markets of our large cities are supplied very abundantly with venison from this species every winter, and at so cheap a rate as to bring it within the means of almost every housekeeper.

The whole of the deer is used by the Indians, and, on pressing occasions, without the previous employment of fire. If a hunter kill a deer after a long and exhausting chase, he applies his mouth to the wound, by which the animal was killed, in order to refresh himself by sucking some of the blood. When very hungry, they cut a hole in the side of the animal, thrust in their hands and tear out the kidneys, which are instantly devoured, though still quivering with life.*

* "After the hunters had been gone for about an hour, captain Lewis again mounted with one of the Indians behind him, and the whole party set out; but just as they passed through the narrows they saw one of the spies coming back at full speed across the plain, &c. The young Indian had scarcely breath to say a few words as he came up, and the whole troop dashed forward as fast as their horses could carry them; and captain Lewis, astonished at this movement, was borne along for nearly a mile, before he learned, with great satisfaction, that it was all caused by the spy's having come to announce that one of the white men had killed a deer. Relieved from his anxiety he now found the jolting very uncomfortable; for the Indian behind him, being afraid of not getting his share of the feast, had lashed the horse at every step since they set off; he therefore reined him in, and or-

The stomach of the deer, with its half digested contents, is a very favourite dish with almost all the savages, especially towards the north, where deer

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dered the Indian to stop beating him. The fellow had no idea of losing time in disputing the point, and jumping off the horse, ran for a mile at full speed. Capt. Lewis slackened his pace, and followed at a sufficient distance to observe them. When they reached the place where Drewyer had thrown out the intestines, they all dismounted in confusion, and ran tumbling over each other like famished dogs: each tore away whatever part he could and instantly began to eat it; some had the liver, and some the kidneys; in short, no part on which we are accustomed to look with disgust escaped them. One of them who had seized about nine feet of the entrails, was chewing at one end, while with his hand he was diligently clearing his way by discharging the contents at the other. It was indeed impossible to see these wretches ravenously feeding on the filth of animals, and the blood streaming from their mouths, without deploring how nearly the condition of savages approaches that of the brute creation: yet, though suffering with hunger, they did not attempt, as they might have done, to take by force the whole deer, but contented themselves with what had been thrown away by the hunter. Capt. Lewis now had the deer skinned, and after reserving a quarter of it, gave the rest of the animal to the chief, to be divided among the Indians, who immediately devoured nearly the whole of it without cooking. They now went forwards towards the creek, where there was some brushwood to make a fire, and found Drewyer, who had killed a second deer: the same struggle for the entrails was renewed here, and on giving nearly the whole deer to the Indians, they devoured it, even to the soft parts of the hoofs. A fire being made, captain Lewis had his breakfast, during which Drewyer brought in a third deer; this, too, after reserving one-quarter, was given to the Indians, who now seemed completely satisfied and in good humour."—*Lewis and Clarke*, i. 375.

feed in great degree on mosses and buds.* European travellers who have tasted of this substance have not found it disagreeable: the Indians eat it altogether, or with a very slight degree of preparation.† However shocking it may appear to us, the prejudice against raw meat is overcome with great ease when hunger pinches severely; and when once the prejudice is removed, a fondness for raw food is very readily acquired, even by those who have previously been fastidious in their tastes.‡

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* "The stomach of no other large animal beside the deer is eaten by any of the Indians that border on Hudson's Bay. In winter, when the deer feed upon fine white moss, the contents of the stomachs are so much esteemed by the Indians, that I have often seen them sit round a deer where it was killed, and eat it warm out of the paunch. In summer the deer feed more coarsely, and therefore this dish, if it deserve that appellation, is then not so much in favour."—Hearne, 318.

† "Of the *nerooka* [the contents of the deer's stomach] I also tasted a small portion, considering that no man who wishes to conciliate or inquire into the manners of savages should scruple to fare as they do while in their company. I found this substance acid and rather pungent, resembling, as near as I could judge, a mixture of sorrel and radish leaves. The smell reminded me of fresh brewer's grains; and the young grasses and delicate white lichens on which the deer feed were very apparent."—*Lyon's Narrative*, 242.

‡ "Dunn and myself, as an experiment, made our breakfast on a choice slice cut [*raw*] from the spine, and found it so good, that at dinner time we preferred the same food to our share of preserved meat, which we had saved from the preceding night. The windpipe is exceedingly good; and I

The skins of the common deer continue to form a very valuable article of commerce, and furnish a material better suited for the manufacture of gloves and various articles of dress, than the skin of any other animal with which we are acquainted. The Indian fashion of dressing these skins consists in depriving them of the hair and fleshy matter, and rubbing them sedulously with a lather made of the brains of the animal until they become uniformly soft, spongy and flexible. In this condition they impart to the touch a sensation of greater softness than that derived from the finest cloth.—Deer skins dressed in this way, however, are very liable to be spoiled by moisture, and rot with great rapidity if they continue for some time exposed to rain.

The buck-skin, as dressed for the use of our glovers, is remarkable for its thickness, softness and pliability,

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am confident, that were it not from prejudice, raw venison might be considered a dainty."—Lyon, 242.

"The most remarkable dish among them, as well as all the other tribes of Indians in those parts, both northern and southern, is blood, mixed with the half digested food found in the deer's stomach or paunch, and boiled up with a sufficient quantity of water to make it of the consistence of pease pottage. Some fat and scraps of tender flesh are also shred small and boiled with it. To render this dish more palatable, they have a method of mixing the blood with the contents of the stomach in the paunch itself, and hanging it up in the heat and smoke of the fire for several days, which puts the whole mass into a state of fermentation, and gives it such an agreeable acid taste, that, were it not for prejudice, it might be eaten by those who have the nicest palates."—Hearne, 317.

and with these advantages it has the great superiority of not being liable to injury from moisture, as tannin is made use of in its preparation. In relation to its warmth, durability and agreeableness to the wearer, it appears to be much preferred to similar leather made from any other skins, whether of European or American deer. Within a few years past the use of buckskin shirts has very much increased among invalids, and often with great advantage. But it is generally believed that these shirts render the body extremely susceptible to changes of temperature, and, all things considered, do more injury than shirts made of flannel or other commonly used materials.

CHAPTER XIX.

Genus V. Antelope; *Antelope*. Pall. &c. &c.

Fr. Antèlope. *Ger.* Antelope.

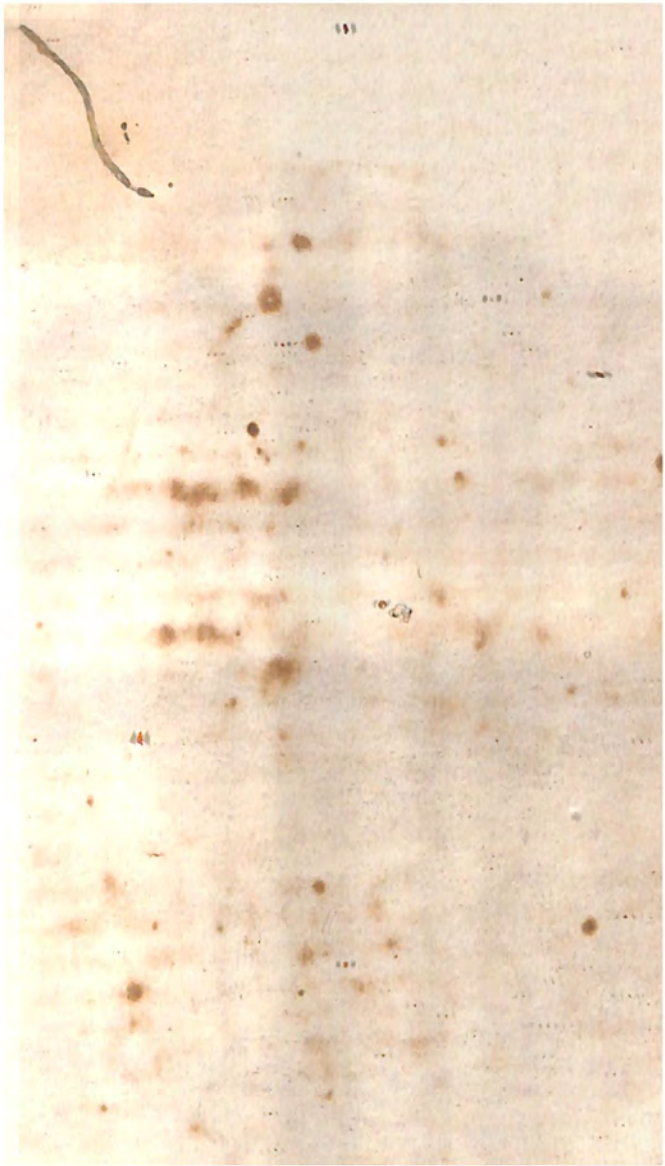
GENERIC CHARACTERS.

The body, ears, eyes and lachrymal or subocular sinuses, are very similar to those of the deer, and the limbs bear an equal resemblance thereto, except that some species of Antelope have tufts or brushes of long hair pending from the carpus. The outline of the front or face is nearly straight, and terminates in a muzzle, or half muzzle, though in some species this is absent. The teats are four or two in number, being sometimes two in one sex and four in the other. The gall bladder is uniformly present, a circumstance in which this genus differs remarkably from the deer.

The horns of both sexes (though in some species the horns are confined to the male) are placed upon a solid bony process of the os frontis. The horns are curved in various directions, being often marked with transverse bands, have a salient spiral line, or are bifurcated.

Dental System.

32 Teeth: { 12 Upper { 0 Incisive, 12 Molar. / 20 Lower { 8 Incisive, 12 Molar.



1 The Mountain Goat 2 Prong Horn Antilope.

SPECIES I.—*The Prong-Horn Antelope.*

Antilope Americana; ORD.

Antelope: LEWIS and CLARKE, i. 75, 208, 369; ii. 169.
Antilope Americana: ORD. GUTHRIE'S Geography, Philad. ed. 1815.
Antilocapra Americana; IBID. Journal de Physique, 1818. SAY. Long's Exped. to the Rocky Mountains, i. 363, 485.
Antilope Furcifer: SMITH. Trans. of Linnæan Society, xiii. pl. 2.
Prong-Horned Antelope: SAB. App. p. 667.

Our adventurous countrymen who led the first expedition across the Rocky Mountains, were the first to call attention to this beautiful animal, and the first to call it by its true name. Notwithstanding the obviousness of all the other characters, the circumstance of its having an offset, or prong to its horns, kept *nomenclators* for years undecided as to what place it should occupy in their arrangements, and gave them an opportunity, by which they have not failed to profit, of multiplying *words* and *republishing* their own names, if they made no addition to our information on the subject. All that has been related concerning this animal which is worth repeating or remembering, was published in Lewis and Clarke's narrative, above quoted, and has since been confirmed by the observations of Dr. Richardson, appended to Franklin's Journey to the shores of the Polar Sea. Leaving to the nomenclators their disputations about what Dekay has happily called "the barren honours of a synonyme," we shall glean the few facts contained in the narrations of the above-mentioned accurate observers of nature.

The prong-horn antelope is an animal of wonderful fleetness, and so shy and timorous as but seldom

to repose, except on ridges which command a view of the surrounding country. The acuteness of their sight, and the exquisite delicacy of their smell, render it exceedingly difficult to approach them; and when once danger is perceived, the celerity with which the ground is passed over appears to the spectator to resemble the flight of a bird rather than the motion of a quadruped.

In one instance Captain Lewis, after various fruitless attempts, by winding around the ridges, succeeded in approaching a party of seven that stood upon an eminence towards which the wind was unfortunately blowing. The only male of the party frequently encircled the summit of the hill, as if to announce any danger to the group of females which stood upon the top. Before they saw Capt. Lewis they became alarmed by the scent, and fled while he was at the distance of two hundred yards. He immediately ran to the spot where they had stood; a ravine concealed them from him, but at the next moment they appeared on a second ridge, at the distance of three miles. He could not but doubt whether these were the same he had alarmed, but their number and continued speed convinced him they were so, and he justly infers that they must have run with a rapidity equal to that of the most celebrated race horse.

Yet, notwithstanding the keenness of their senses, and surprising velocity of their course, the prong-horn antelope is often betrayed to his destruction by curiosity. When the hunter first comes in sight, his whole speed is exerted, but if his pursuer lies down, and lifts up his hat, arm or foot, the antelope

trot back to gaze at the object, and sometimes goes and returns two or three times, until it comes within the reach of the rifle. This same curiosity occasionally enables the wolves to make them a prey; for sometimes one of them will leave his companions to go and look at the wolves, which, should the antelope be frightened at first, crouch down, repeating the manœuvre, sometimes relieving each other, until they succeed in decoying it within their power, when it is pulled down and devoured. But the wolves more frequently succeed in taking the antelopes when they are crossing the rivers, as they are not good swimmers.

"The chief game of the Shoshonees," say Lewis and Clarke, "is the antelope, which when pursued retreats to the open plains, where the horses have full room for the chase. But such is its extraordinary fleetness and wind, that a single horse has no possible chance of outrunning it, or tiring it down; and the hunters are therefore obliged to resort to stratagem. About twenty Indians, mounted on fine horses, armed with bows and arrows, left the camp; in a short time they descried a herd of ten antelopes: they immediately separated into squads of two or three, and formed a scattered circle round the herd for five or six miles, keeping at a wary distance, so as not to alarm them till they were perfectly inclosed, and usually selecting some commanding eminence as a stand. Having gained their positions, a small party rode towards the herd, and with wonderful dexterity the huntsman preserved his seat, and the horse his footing, as he ran at full speed over the hills and down the steep ravines, and along the borders of the precipices. They were soon outstripped by the antelopes, which, on gaining the

other extremity of the circle, were driven back and pursued by the fresh hunters. They turned and flew, rather than ran, in another direction; but there too they found new enemies. In this way they were alternately pursued backwards and forwards, till at length, notwithstanding the skill of the hunters, (who were merely armed with bows and arrows) they all escaped; and the party, after running for two hours, returned without having caught any thing, and their horses foaming with sweat. This chase, the greater part of which was seen from the camp, formed a beautiful scene, but to the hunters is exceedingly laborious, and so unproductive, even when they are able to worry the animal down and shoot him, that forty or fifty hunters will sometimes be engaged for more than half a day, without obtaining more than two or three antelopes."

The prong-horn is found in the vicinity of Carlton House during the summer, and is usually called a *goat* by the Canadians. The Creek Indians call them *apestachoekoos*. Lewis and Clarke saw the animal very frequently during their journey to the mouth of the Columbia River, though they were fewer on the plains of Columbia than on the eastern side of the Rocky Mountains.

Great numbers of these animals were seen by Lewis and Clarke in the month of October, near Carp Island, in the Missouri, where large flocks of them were driven into the water by the Indians.—The men were ranged along the shore so as to prevent the escape of the antelopes, and fired upon them, and sometimes the boys went into the river and killed them with sticks. Fifty-eight of the antelopes were killed by the Indians during the time

they were observed by our travellers. They were then migrating from the plains east of the Missouri, where they spend the summer, towards the mountains, where they subsist on leaves and shrubbery during the winter: in the spring they resume their migrations.

The Mandan Indians capture the prong-horn antelopes by means of a pound similar to that described in the account of the rein-deer.

The following description is given by Dr. Richardson, from a recent specimen:—"The male is furnished with short, black, roundish, tapering horns, arched inwards, turning towards each other, with their points directed backwards, each horn having a single short branchlet projecting from the middle. The winter coat consists of coarse, round, hollow hairs, like those of the moose. The neck, back and legs are yellowish brown; the sides are reddish white; the belly and chest is white, with three white bands across the throat. The hairs on the occiput and back of the neck are long and tipped with black, forming a short erect mane. There is a black spot behind each cheek which exhales a strong goat-like odour. The tail is short; on the rump there is a large spot of pure white. The dimensions of the animal were as follows:—from the nose to the root of the tail four feet; height of the fore shoulder three feet; that of the hind quarter the same. Girth behind the fore-legs three feet; girth before the fore-legs two feet ten inches. The female is smaller than the male, having straighter horns, with rather a protuberance than a prong. She is also deficient in the black about the neck.

Genus VI. Goat; *Capra*, L.

Fr. Chêvre. *Germ.* Ziege.

GENERIC CHARACTERS.

The outline of the front is rather straight, or slightly concave; there is no muzzle nor sub-ocular sinuses; the interspace of the nostrils is naked; the horns are turned upwards and outwards. The body is slender, the tail short, and the limbs somewhat robust. The teats are two in number. The hair is of two sorts; the exterior is long, or very long and smooth, forming a beard beneath the chin. Sometimes there are cuticular appendages hanging from the inferior surface of the neck. The testes are contained in a very large scrotum.

Dental System.

32 Teeth: { 12 Upper { 12 Molar. / 20 Lower { 8 Incisive, 12 Molar.

Species I.—*Rocky Mountain Goat.*

Capra Montana; Ord.

Ovis Montana; Ord. Guthrie's Geography, Philad. ed. 292, 309. ibid. Journ. Acad. Nat. Sciences, i. part 1. p. 8.
Rupicapra Americana: Blainville. *Antilope Americana:* ibid. Bullet. de la Société Philomathique, p. 80.
Antilope Lanigera: Smith, Trans. Linnæan Society, xiii. pl. 4.

[*Commonly called Rocky Mountain Sheep.*]

This animal, concerning which very little is known, is stated by Major Long, in his communication to

the Philadelphia Agricultural Society, to inhabit the portion of the Rocky Mountains situated between the forty-eighth and sixty-eighth parallels of north latitude. By Lewis and Clarke it was observed as low as forty-five degrees north. They are in great numbers about the head waters of the north fork of Columbia river, where they furnish a principal part of the food of the natives. They also inhabit the country about the sources of Marais or Muddy River, the Saskatchawan and Athabasca. They are more numerous on the western than on the eastern slope of the Rocky Mountains, but are very rarely seen at any distance from the mountains, where they appear to be better suited to live than elsewhere. They frequent the peaks and ridges during summer, and occupy the valleys in winter. They are easily obtained by the hunters, but their flesh is not much valued, as it is musty and unpleasant; neither do the traders considers their fleece of much worth. The skin is very thick and spongy, and is principally used for the purpose of making moccasins.

The Rocky Mountain goat is nearly of the size of a common sheep, and has a shaggy appearance in consequence of the protrusion of the long hair beyond the wool, which is white and soft. Their horns are five inches long and one in diameter, conical, slightly curved backward, and projecting but little beyond the wool of the head. The horns and hoofs are black.

The first indication of this animal was given by Lewis and Clarke, and it is much to be regretted that so little is still known of the manners and habits of this species. The only specimen preserved entire,

that we know of, is that figured by Smith in the Linnæan Transactions, from which the figure in our plate is taken. The fineness of the wool of this animal may possibly hereafter induce persons who have it in their power to make some exertions to introduce this species among our domestic animals. It is said that the fleece of this goat is as fine as that of the celebrated shawl goat of Cashmere.

Genus VII. Sheep; *Ovis*, L.

GENERIC CHARACTERS.

The outline of the face is arched, or convex, and the mouth has no muzzle; the ears are pointed, and of middling length; the horns, which are transversely wrinkled, large and triangular, are twisted laterally into a spiral, and have an osseous core, of a cellular or cancellar structure. The limbs are slender, and covered with uniform short hair; the tail is short, curved downwards, or pendulous. Neither suborbicular sinus, beard, nor inguinal pores, exist in this genus.

Dental System.

32 Teeth: { 12 Upper { 12 Molar. / 20 Lower { 8 Incisive, 12 Molar.

Argali. 1. Male. 2. Female.

Species I. *The Argali.*

Ovis Ammon: L.

Ovis fera Sibiricæ: vulgo, Argali dicta; Pall. Spicil. Zool. fasc. xi. pl. 1.
Monflor Argali: Shaw, Gen. Zool. ii. part 2. pl. 201.
Ovis Montana: Geoff. Ann. du Mus. ii. pl. 60.
Big Horn: Lewis and Clarke, i. 144.
Monflor D'Amerique: Desm. Mam.

The Argali is found in Northern Asia, and Eastern Siberia, whence it appears gradually to have passed into North America by crossing the ice, where the continents are separated but by a narrow strait. In America it inhabits the Rocky Mountains, in about the fiftieth degree of north latitude, and extends along the Rocky Mountain range into California. In these mountains the argali are seen in troops containing twenty or thirty, feeding upon the most precipitous parts of the ground, and leaping with wonderful activity, and at great distances, from rock to rock.

The spring of the year and autumn are said to be the sexual seasons of this species, during which period the males acquire the same disposition to fight with each other as we have described in treating of the deer.

Two specimens of the argali, a male and female, were brought in by Lewis and Clarke, and may be seen in the Philadelphia Museum, where they are preserved. The engraving will give a good idea of these animals, though the specimens just mentioned, from which the drawing was made, are much injured by time and exposure to the dust.

The male has very large horns, which arise quite near to the eyes, curve at first backwards, then bend forwards, and have their points turning upwards and outwards. These horns are triangular at the lower part, have their broadest surface forwards, and are deeply wrinkled thence for the half of their length; the superior part is smoother. The ears are straight, broad and pointed. The tail is quite short.

The colour of the argali, during summer, is of a grayish fawn, generally having along the back a deeper yellow or reddish line. Around the root of the tail, upon the buttocks, there is a spot of the same colour. The belly and inner surface of the limbs have a pale brownish or dirty white colour. The winter pelage is of a deeper reddish tint above, while the mouth, under part of the throat and belly, are nearly white.

The horns of the female are slender, when compared with those of the male, being almost straight and little wrinkled.

The dimensions of a large male killed by Mr. M'Gillivray in 1800 were these:*—from the nose to the base of the tail five feet; length of the tail four inches; girth of the body four feet; height of the body three feet eight inches. The horn was three feet and a-half long, and was one foot three inches in circumference at base.

It is much to be regretted that we are not better

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* See his paper in the New York Medical Repository, vol vi. 238.

acquainted with the peculiar history of this animal drawn up by some one who has studied it in its native wilds; more especially as this species is said to be the source whence all the varieties of our domestic sheep are descended, an opinion which the form and proportions of its body seem to confirm, but one which would scarcely be imagined, if we relied upon the condition of the hair or wool by which the wild animal is covered.

END OF VOLUME II.

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